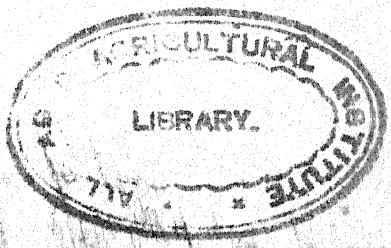
TROPICAL NURSING



TROPICAL NURSING

A HANDBOOK FOR NURSES AND OTHERS GOING AEROAD

BY

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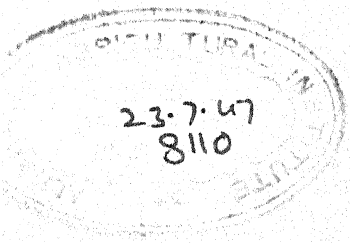

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TROPICAL NURSING

INTRODUCTORY

THE nurse, if she is to give of her best, must possess both knowledge and experience. The greater her measure of these, the better will she be equipped to meet the demands of her work. Manifestly, when venturing abroad for the first time from a temperate country, her knowledge of the work ahead cannot at best be more than sketchy, or, what is worse, may be based on popular fallacies; her experience also can be but slight. A keen nurse will recognize this, and will appreciate that her home training and experience are but a secure foundation on which to build the special knowledge required for work under conditions and among diseases she has not hitherto encountered. She should not imagine, however, that the general training is ever to be forgotten or its maxims ignored. In its essentials, good nursing is the same at all times and in all places; it has only to be adapted to necessities or circumstances.

In dealing with the unexpected, the nurse will find that, however urgent a situation may be, a moment's clear thinking will enable her to guide impulse by reason, and the time so spent will never be wasted. No training or knowledge can ever yield their best results unless backed by a practical outlook, which, in the end, amounts to nothing more nor less than common sense. Kipling aptly expresses this thought:

> For they taught us common sense—
> Tried to teach us common sense—
> Truth and God's Own Common Sense,
> Which is more than knowledge!

A difficulty which at the outset may confront the nurse is her inability to speak the language of the country, so the more necessary does it become that she should develop clinical astuteness and exercise knowledge and sympathy to interpret the patient's condition and needs. If any criticism can be made against hospital training, it is that nurses and students, in the ardour of their work, are so obsessed by attaining perfection of technique and the purely scientific treatment of disease, that they are apt to overlook that it is, in sooth, *patients* —fellow-creatures with feelings—who are the objects of that treatment.

> We are afflicted by what we can prove,
> We are distracted by what we know—

It should never be forgotten that the mental or psychological outlook of a patient can heavily load the scales of sickness—whether it shall be in favour of recovery rests largely with the nurse.

Turning now to the environment of the tropics as it affects nursing and the course of illness, adverse conditions, such as heat, glare and insect pests, affect debilitated subjects more than the robust, and must therefore be minimized as far as lies in the nurse's power. Just as the growth of tropical vegetation is both rapid and luxuriant, so also is the growth of germs or bacteria, which, after all, are but vegetation of microscopic dimensions. Consequently, illness in the tropics is more likely to be acute, whether the disease be peculiar to warm climates or one familiar to the nurse in temperate zones. Septic organisms are both more prevalent and more virulent so that a degree of carelessness which in temperate zones would lead to but occasional trouble would, in the tropics, be responsible for much acute illness, or even, in infant welfare, for appalling mortality.

Another aspect of work in the tropics is the irritating

effect of the climate. The nurse must so order her own work and that of her subordinates that maximum efficiency can be obtained with minimum labour and, above all, with the absence of friction. Squabbling, scolding, fretting—all are forms of mental friction which give rise to heat, and of heat there is already more than enough. As Kirk suggests, the best method of keeping cool is to avoid getting hot. At times, to be sure, juniors and seniors alike may prove provoking, the patients and their relatives exasperating, the heat stifling, and the surroundings monotonous; it is just then—when the nurse herself feels "on edge"—that the exercise of self-control is worth untold gold; the very thought of it will cause troubles to lessen and the peevish fit to pass.

A sense of humour and a correct mental perspective (that is, the power to discriminate between trifles, however vexatious, and more serious incidents) will carry a nurse far on the road to happiness; while an upright and smart carriage is one of the surest antidotes to fatigue. As it is a physiological fact that the mere act of holding up the head and bracing back the shoulders at once tones up the whole system, it is at least worthy of trial.

If sent "up country" to a bungalow to nurse the housewife, the nurse may be expected to lend a hand with, or entirely to run, the household affairs, and in these circumstances should naturally and cheerfully take over such responsibilities. Confidence and tact will keep things going, and the normal routine should be disturbed as little as possible; innovations are hated by native servants, and seldom welcomed by the residents. The nurse's duty is to run the home as the owners wish, rather than to run it as she would her own. Above all, she should remember that what is seen or heard when out nursing, be it accidental or in the course of duty, is

to be treated confidentially, and never mentioned, much less retailed as gossip.

In dealing with natives, difficulties may arise out of superstition, ignorance or religious beliefs. Such obstacles must be overcome by tolerance and understanding. The natives' beliefs are as natural and as real to them as are the nurse's beliefs to herself, and nothing will be gained by unjust rebuke. It is even possible that the trouble may have arisen out of native wisdom derived from centuries of tropical experience; it is well to ponder Kipling's warning:

> Now it is not good for the Christian's health to
> hustle the Aryan brown,
> For the Christian riles and the Aryan smiles and he
> weareth the Christian down;
> And the end of the fight is a tombstone white with
> the name of the late deceased,
> And the epitaph drear: 'A fool lies here who tried to
> hustle the East.'

SECTION I

PERSONAL HYGIENE IN THE TROPICS

ARRIVED in the tropics, the nurse will find differences in climatic and living conditions from those of temperate regions. The change must be met by adaptation of the body and mode of living, the body's adjustment being automatic but requiring voluntary help from correctly adjusted habits of life. The three principal variants are the climate, the food and the living conditions.

The climate.—The two extremes are the hot, dry climate in which there are scorching days, made worse upon occasion by parching winds and sandstorms, followed by relatively chilly nights; and the warm, dank climate wherein one lives continuously in a "hot-house" atmosphere. The dangers of the first are sunstroke and sudden chills to the body from too rapid evaporation of the perspiration by day or from the sudden drop in temperature by night; while the disadvantages of the second are loss of vitality, heat stroke, and growth of moulds and fungi in belongings and food.

The food.—Food readily becomes putrefied or contaminated with disease germs, and is generally lacking in variety, succulence and nourishing power.

Living conditions.—Outlying stations do not offer the facilities and public and personal services provided in towns: the water supply, for example, may be crude, the sewage system non-existent; the nearest stores may be some days' journey away; so may the nearest dentist. Again, insects may be a veritable plague. To meet these and a hundred and one other new conditions the following few suggestions are given; many others will be learnt from the residents in the district, but only experience can teach their value.

Kit.—Provide warm as well as cool clothing; it will be needed, if only for the return journey. A woollen coat for use after tennis, etc., is most useful. Clothing should be loose fitting; underwear plentiful and of good silk, silk and cotton, or fine cellular material, preferably dark-coloured or black. Underwear should be so designed that every garment hangs from the shoulders. Standardized uniform, or a simple white gown, is worn with open neck, low collar and short sleeves. The seams in the armpits should be double-sewn. Evening dresses wear best if made of good crêpe-de-Chine or satin, and an evening wrap will be required. Footwear should be of the best, carefully fitted at least a size larger than that usually worn, because in hot weather the feet tend to swell; or, possibly, two pairs of stockings may have to be worn (*see* p. 108). Every-day shoes should have rubber heels. Mosquito boots should be provided; and, of course, a mosquito net (*see* p. 107).

Choose light, airy hats, but provide adequate protection from the sun, either a helmet, which is most serviceable (it should be purchased abroad), or a parasol lined with green, the outer covering being of a good material such as heavy tussore. Sun glasses should be of Crookes's glass with non-rusting rims. For night attire pyjamas are best, with the addition of a cholera-belt worn outside should the nights be chilly. Children should be attired in one-piece suits, infants in night-dresses long enough to be tied at the bottom; an exposed body is so easily chilled. If a mackintosh and goloshes or rubber boots are needed, see that the seams are stitched, not merely *stuck* together.

It is advisable for protection to keep clothes in an air-tight metal box, but they should be frequently aired. A good electric torch of a size for which new batteries can be readily obtained is very useful. A spare light-bulb should be provided. In very damp places, how-

ever, such a torch is useless. If glasses are worn, a spare pair should be kept.

Food and drink.—Avoid eating re-served meat or uncooked foods (*see* p. 68). Milk (which should be boiled) and butter should be stored in an ice chest; local cheese is best avoided. Fresh fruits should be taken in moderation, but the rind must be removed completely when, and only when, the fruit is about to be eaten. Protect everything connected with food from flies and dust, and provide fly-covers for table use. Safes and tables may be secured from ants by standing the legs in tins containing watery antiseptic, which must, of course, be renewed as it evaporates, and all furniture should stand clear of the walls. Tinned foods are much used; be sure that the tins are not broken, that their ends are not bulged out, and that they have not more than two sealed openings. Once the tin has been opened, empty out the contents completely and make certain there is no improper odour. Drink large quantities of fluid to replace that lost by perspiration, and to keep the urine from becoming too concentrated. When perspiration has been excessive, a little salt added to the water is beneficial, as much salt is lost through perspiration. Home-made lemonade, or barley-water flavoured with lemon, are best, alike for children and adults. Tea and coffee are good in moderation, and, as a thirst quencher, unsweetened cold tea without milk or sugar is unrivalled. Drinks should be sipped, not gulped, and should not be always iced. Whenever ice is used, however, it should be put *around*, not *in* the beverage: goodness only knows from what water the ice may have been made!

Water should never be taken into the mouth unless it has been boiled; filters for the most part simply give a false sense of security. Aerated waters should come from a reliable source, but at best are not good for

constant consumption; when they are home-made see that the syphons are scalded out and the water filtered and then boiled. Alcohol is not necessary, but may be taken in moderation in the evenings or with meals in the form of light lager, wine, or spirits; cocktails on an empty stomach are harmful. Pans, dishes, tables, sinks, etc., should be kept clean and scalded. Note that native servants' ideas of cleanliness may differ vastly from the modern conception of the word; therefore personal supervision of boiling and cleaning is required, and routine methods should be instituted.

Exercise and rest.—Outdoor exercise should be taken regularly, preferably in the mornings or late afternoons, certainly not in the heat of the day when rest is more suitable. A short daily rest is as essential as exercise, and must be complete: make a habit of banishing for a time all feeling of activity, mental and physical; lie on a bed or in a lounge chair with the feet up—and relax! The art of relaxing can be acquired, and is good alike for health, happiness and looks. In hospital a daily routine is followed: when working in private a nurse must also have her daily routine, but should endeavour to make it conform with that of the family with which she is staying. Routine prevents much worry, helping to keep one fit and cool.

Routine.—Change of underwear daily, if not more frequently, is essential. Baths should be hot or tepid, and may advantageously be just coloured with potassium permanganate, especially when prickly heat is troublesome. They should be taken at least once daily, and should be rapid—no lying to soak. Do not let the bath water splash into the mouth. Use a good dusting-powder. Sea-bathing is pleasant, but avoid the hottest part of the day, or undue exposure of the head and neck to the sun. Always wear bathing shoes, and beware of fresh-water bathing (*see* p. 14). Keep the armpits free

of hair by shaving or by using some harmless depilatory. The feet, if sore or tender, should be rubbed with spirit after the bath, or with a solution of formalin—a teaspoonful to a pint of water. If bitten by insects, apply to the spot a little iodine or weak ammonia. If bitten by a leech, or a tick, do not attempt to pull the creature off but, instead, apply salt to the leech, or turpentine to the tick, and the offender will quickly release its hold. Never neglect to shake out your shoes before putting them on.

The teeth require great attention; have them put right before going abroad, and keep them clean by using a soft brush after every meal. If dentures are used provide a spare set. Water for cleaning the teeth should always be boiled. Attend to the bowels. The great cause of constipation is lack of sufficient water; try drinking more before resorting to medicines. Immediately after arrival the menstrual periods may alter, but should soon return to normal; if not, or if the general health is much affected by the new surroundings, seek medical advice.

SECTION II

DISEASES

BERIBERI

BERIBERI is a form of peripheral neuritis affecting the limbs, vascular system, and heart especially, occurring mainly among rice-eating natives of the East.

Cause.—There is still discussion about the exact cause of this disease; probably it is due solely to a deficiency in the diet, but develops more quickly and more severely in damp and insanitary conditions.

The food deficiency is the absence of a sufficient quantity of vitamin B, and occurs especially where highly-polished white rice forms the principal food over long periods. Vitamin B is certainly present in rice, but is found principally in the husk and the young growing germ, both of which are removed by polishing. The vitamin, however, occurs in all young growing seedlings. Rice, beans and peas which have just been allowed to germinate possess it in abundance. It is present also in green vegetables, yeast and eggs.

Clinical condition.—The patient's first complaint is usually of numbness in the hands and feet, and inability to use his hands properly. The disease may develop slowly or with great rapidity and, according to the more predominant symptoms, the patient is said to have "dry" or "wet" beriberi. It occurs in both sexes and in children.

Dry beriberi is a condition of pure neuritis affecting most of the nerves of the body. This results in a weakness or even paralysis of the muscles supplied by these nerves, and in addition there is much atrophy or wasting of the muscle tissue. Thus there is numbness or tingling

in the limbs, more or less loss of power of movement, and a general flabbiness and wasting of the body.

The patient may be quite unable to walk or, if he can, does so with difficulty, dragging his toes along the ground. This is due to loss of power to dorsiflex the foot, the condition being known as dropped foot. In order to bring his toes clear of the ground, the patient will sometimes raise his whole foot high with each step, the toes hitting the ground with a flop as the foot comes down again. This gait, known as the "high-stepping" gait, is seen in any condition of dropped foot, but in few diseases is it as marked as in beriberi.

There is rarely any pain, but firm pressure anywhere will elicit tenderness.

All deep reflexes, such as the knee-jerks, are absent.

Wet beriberi is very similar to the dry type; but there is, in addition, dropsy, almost generalized œdema together with effusions into the pleuræ, pericardium and peritoneum. The victim of wet beriberi is, therefore, a patient with muscle weakness and the puffy, bloated appearance of dropsy.

In both types the nerves to the heart are affected, resulting in weakening of the cardiac muscle, and it is this which makes beriberi such a dangerous and uncertain disease; at any moment, upon the slightest exertion, the patient may suddenly die from heart failure, owing to over-dilatation of the heart.

The urine may contain a trace of albumin, but often shows no change from normal. In wet beriberi the passing of large amounts of urine (polyuria) is a good sign, whereas a diminution in quantity is bad.

The blood-picture remains nearly normal, and there is no fever.

Treatment.—The cure of the disease depends on supplying the body with sufficient vitamin B, but this must be supplemented by careful nursing during the

acute phase. At this time the doctor will probably give intravenous injections of some vitamin B preparation.

Owing to the risk of cardiac failure, it is essential that the nurse should exercise constant care to avert such a disaster. A momentary lapse or slackness may mean death. The full co-operation of the patient must be sought right from the beginning, or enjoined, if necessary, by explaining the danger of neglecting instructions.

If possible, nurse the patient away from insanitary or low-lying districts. Order complete rest in bed, the patient to lie quite flat and make no attempt to turn himself, much less sit up. In bad cases the patient should lie perfectly still, all feeding, turning or settling comfortably being done by the nurse. The bed-pan must, of course, be employed, but with care, the patient being carefully lifted and placed upon it without any voluntary effort. The bowels must be kept comfortably loose by liquid paraffin, laxatives or, if necessary, enemata. On no account must straining at stool be permitted. Measure the urine daily.

The diet should consist of light, easily-digested foods, which should include fresh green vegetables, eggs, and peas or beans which have been damped for a few days to allow them to germinate.

Yeast is sometimes given in the form of Marmite. Parboiled rice is one of the very best foods for the Eastern native. This is whole rice which has been steamed and husked. Ordinary polished rice must be absolutely forbidden. In dry beriberi the patient may have the ordinary amount of fluids, but in the wet type, fluids should be reduced to the least possible amount, and no salt should be given.

Such is the strict nursing of a patient with beriberi, and it will be well to follow it out in detail until the doctor in charge permits the nurse some relaxation. By

so doing the nurse will know that she, at least, cannot be held responsible for any sudden disaster.

As the patient recovers he will be permitted more and more freedom of movement until he is eventually walking about and quite strong again, which may not be for weeks or months.

PREVENTION.—From a knowledge of the cause of the disease it is obvious that prevention lies in the provision of a diet containing an adequate amount of vitamins, polished rice being insufficient; and in removal of insanitary conditions. The patients may be nursed in a general ward without danger to others.

BILHARZIASIS
(OR SCHISTOSOMIASIS)

The bilharziæ are small worms, or flukes, which infest man and give rise to three serious diseases known collectively as bilharziasis, each disease being caused by its own special bilharzia.

1. *Bilharzia hæmatobia* causes hæmaturia.
2. *Bilharzia mansoni* causes dysentery.
3. *Bilharzia japonica* causes cirrhosis and ascites.

Bilharzia hæmatobia

This fluke, discovered by Bilharz, occurs in parts of Australia, but for the most part is found scattered widely in Africa, being a veritable scourge in Egypt.

LIFE-HISTORY.—The adult parasites live in the large blood-vessels of the human liver, and thence make their way along the blood-vessels to the small veins surrounding the urinary bladder. There the female starts to lay her eggs, and, if the patient is not treated,

continues to do so for many years. The eggs have small oval shells each furnished with a spike at one end, and in time work their way through the walls of the veins, then through the wall of the bladder, there mingling with the urine and the blood which has come from the tiny punctures the eggs have made in the bladder wall. This blood may be small or large in quantity, but is always present. It follows, therefore, that with each act of micturition eggs and blood-cells are voided with the urine, especially with the last few drops, when the contracting bladder wall squeezes out the remaining eggs. If this urine is passed or thrown into any fresh water the eggs soon hatch out into little embryos. These swim about looking for certain types of fresh-water snails which are commonly found in streams or marshes. Once an embryo, or *miracidium*, as it is called, has found such a snail, it bores into the snail's liver and there undergoes further growth, and changes into a minute tailed form known as a *cercaria*. This cercaria, the immature fluke, eventually emerges from the snail and once again swims about in the water. Now, however, it is no longer looking for a snail to attack, but is in pursuit of man or large animals. Such luckless individuals as may happen to bathe or wade in infected water are promptly attacked, the little cercariæ burrowing through the skin. They then make their way through the victim's body to the liver, where the cercariæ grow into adult worms and start a new generation and induce the symptoms of the disease.

Man, it is evident, can be infected only from water which contains cercariæ, i.e. embryos which have already passed through their development in a snail.

Clinical course.—At the time of infection the patient may feel a slight tingling in the skin. Long afterwards he becomes less energetic and may notice a little pain in the bladder when passing water, although

many natives have the disease without even being aware of its existence. The trouble can, however, be much more severe, the symptoms then being painful micturition, hæmaturia and a hot, painful feeling in the perineum aggravated by exercise, especially riding. There may be a little fever and loss of appetite and, in the absence of treatment, these symptoms can persist for years. The constant loss of small quantities of blood results in anæmia and loss of vitality and, hence, loss of working power.

Blood examination shows an eosinophilia.

In cases of long standing the eggs not only penetrate the bladder wall, but work their way out through the urethra and perineum, causing stricture, abscess, and multiple fistulæ. In addition to albumin, the urine on microscopical examination will be found to contain blood, pus and the characteristic bilharzia eggs.

Diagnosis.—In a district where the disease is common the diagnosis is clear from the symptoms; otherwise, and always for confirmation, the diagnosis must be determined by microscopic demonstration of eggs in the patient's urine. This procedure is facilitated by collecting the specimen of urine in the correct manner:

1. Obtain the sample, if possible, after the patient has been walking or riding.
2. Instruct the patient to pass water, and to collect in a specimen glass only the last few drops. An inch of urine, collected in this way, is more use for diagnosis than is a glassful if the last drops are lost.

Treatment.—*Medical.*—Antimony tartrate is given intravenously. The initial dose usually is half-a-grain, and each dose is increased by half-a-grain up to 2½ gr., an injection being given every other day. A total

of about 20 gr. is required to obtain a cure. Other compounds of antimony are superseding the tartrate.

Nursing.—Fomentations to the perineum may be required. Give plenty of water to drink and keep the bowels open by salines. Measure the urine daily. Occasionally some joint pains follow an antimony injection; such should be reported before the next injection is given. Frequently an injection causes a little cough, so have a glass of water ready, as a sip helps to allay the irritation.

Give no food for two hours before or after an injection, otherwise abdominal cramps, vomiting and diarrhœa may occur. Patients need not be confined to bed during treatment.

Complications.—Occasionally the orifices of the ureters into the bladder become narrowed by scars, resulting in back pressure on the kidneys and secondary infection or renal insufficiency. Stone-formation is common, either in the bladder or ureters. Rarely, blood-clotting will cause retention. The eggs sometimes work their way into the rectum, and so cause dysenteric symptoms. Any sign of these developments must be reported.

Bilharzia mansoni

This parasite is found chiefly in South America, the West Indies, and Central and West Africa.

The life-history is similar to that of *B. hæmatobia*, but differs in that the female lays her eggs in the blood-vessels, not of the bladder, but of the rectum, and that the miracidia attack a different kind of snail.

Infection occurs in the same manner by way of infected water, the disease being called *rectal bilharziasis.*

Clinical course.—The patient experiences a burn-

ing feeling in the rectum, and has diarrhœa with mucus and blood. Sometimes the stool, if formed, is characteristic, the first part consisting of mucus streaked with blood forming a "cap" to the remainder of the stool, which is normal. The eggs are oval, with a lateral spine, and can be detected in the stool by microscopic examination, particularly in the "cap," which must be most carefully saved for examination. Sigmoidoscopy (*see* p. 37) will show puckering and scarring of the bowel in severe cases.

Complications.—Numerous fistulæ around the anus are common. Rectal polypi may form and aggravate the symptoms, sometimes leading to prolapse of the rectum.

Occasionally some of the ova pass into the bladder and cause urinary symptoms.

Treatment.—The medical treatment and nursing are very much on the same lines as in the previous infection. Diet should be light and nourishing, and the bowels should be kept loose with some such preparation as liquid paraffin.

Bilharzia japonica

Found in China and Japan, this fluke resembles the two previous ones in its life history, another species of snail serving its purpose for development. The eggs are nearly round and have practically no spine. The disease caused by *B. japonica* is known as *intestinal bilharzia.*

Pathology.—The worms inhabit the blood-vessels of the portal system, occurring in the liver and along the intestines and omentum. The liver becomes riddled with eggs, and much matting and adhesions occur around the intestines. Ascites follows, and the spleen becomes greatly enlarged.

Symptoms.—The symptoms can be grouped into three stages: (1) evidence of infection and toxæmia in the form of bronchitis or coughing, urticaria and a high eosinophilia; (2) enlargement of the spleen and liver with diarrhœa or dysentery and abdominal pain; (3) ascites and œdema with increasing dysentery and wasting.

Without treatment the disease ends fatally after some three to five years.

Treatment.—*Medical* treatment is similar to that employed for the other two types, and if begun early will quickly produce a cure.

Nursing is the general nursing of any chronic abdominal condition. The patient should be kept in bed, warm and comfortable. Should the doctor decide to tap an ascitic abdomen, the nurse must, before the operation, place behind the patient a binder which can be tightened as the fluid escapes. This lessens the chance of collapse from too sudden removal of the fluid.

Prophylaxis.—It will be seen from the life-history of all three species of bilharzia that infection takes place by way of water in which cercariæ are present, whether it is used for drinking or bathing purposes. The safe rule, then, for infested districts, is that no water should be drunk unless properly disinfected or boiled, and that no bathing, wading, or washing should be done in any water of doubtful purity.

BLACKWATER FEVER

Blackwater fever is a dread disease of sudden onset with complete prostration, high fever and the passage of hæmoglobin in the urine; the disease is indirectly caused by subtertian malaria.

Cause.—While certain strains of the subtertian

parasites appear to carry the potentiality of causing blackwater, the following factors have a direct bearing upon its onset.

1. Individual and racial susceptibility: white races are more readily affected than coloured races.
2. Residence, or former residence, for some time in a district where blackwater fever is found: such districts are usually intensely malarious.
3. Infection with subtertian malaria: it is doubtful if blackwater fever ever occurs in anyone who has not been infected with subtertian malaria parasites, although no clinical signs of malaria may have been detected.
4. Administration of quinine: while blackwater can occur in those who have never taken quinine, or in those who make a practice of taking quinine in small doses regularly, it is common knowledge that *irregular* administration of quinine, or a sudden large dose during a bout of subtertian malaria, may start an attack of blackwater fever.

Distribution.—Blackwater fever occurs in scattered districts in the tropics and sub-tropics, being especially found along the west coast of Africa, and in parts of India.

Pathology.—With the onset of an attack there is a sudden and profound destruction of the red blood-cells, so that their colouring matter, the hæmoglobin, is set free in the blood-stream, and is thence passed into the urine by the kidneys.

The destruction of the blood-cells causes intense anæmia, and the presence of the hæmoglobin in the tissues causes jaundice. The spleen, which is large at the beginning of the attack, rapidly decreases in size. The liver is usually enlarged and the flow of bile increased. The kidneys are congested and nephritis is

present, while in some cases the hæmoglobin is precipitated in the kidney tubules, so obstructing them that suppression occurs, leading to anuria. Malarial parasites may or may not be found in the blood. The urine may be passed in copious amounts, or may be completely suppressed. When at its worst it varies in colour from that of port wine to stout; and, as improvement occurs, passes through lighter shades of reddish-brown to a mahogany colour, and eventually to normal. It is loaded with albumin and contains casts and much débris.

Clinical course.—It is important to realize that impending blackwater fever can sometimes be recognized clinically before an attack comes on, and if proper precautions are then adopted, it may be possible to ward off the threatened attack.

Pre-blackwater state.—The clinical picture is that of a person who is in, or has recently come from, a district where blackwater fever abounds; and who is anæmic and very sallow, almost jaundiced. Frequently, he complains of headache, lassitude and drowsiness; slight tremor may be noticed in the hands; the spleen is usually enlarged, and the urine appears to (though it does not actually) contain bile. The temperature may be subnormal, or a low fever may have been present, off and on, for some time. Perspiration is easily induced. To a person in such a state, exposure to a chill or wetting, over-exertion, or fasting, may determine the onset of blackwater: it is for such a person, also, that a large dose of quinine, indeed even 5 grains, may spell disaster.

Symptoms.—The victim gets a sudden rigor and feels that he is overtaken by a bad bout of malaria; soon a desire to micturate arises and the patient discovers that the urine is of a blood-red colour or even darker. Rapidly the feeling of illness increases; headache and backache are troublesome; thirst becomes marked, frequently in

direct proportion to the amount of vomiting, which may be slight or so bad that it is almost continuous, and it may be impossible for the patient to retain anything taken by mouth. Abdominal or splenic pain may be felt.

The urine varies in amount and colour, and indicates the progress of the disease. Hiccough occurs in some cases and is a bad sign. Complications, such as pneumonia, parotitis, delirium or sudden cardiac failure are to be dreaded. The temperature is high and remittent or intermittent; hyperpyrexia may occur.

The duration of an attack is uncertain; there may be just one bout of blood destruction and blackwater fever which gradually clears off, or there may be repeated attacks of hæmolysis, either at short intervals or following each other so quickly that their effect on the urine is almost continuous. Such patients exhibit marked polyuria and are likely to bleed to death or, should the kidneys become blocked, suffer from suppression and anuria. The patient becomes very anæmic, and rapidly jaundiced to a lemon-yellow tint; some œdema may be noted in the limbs and face, especially if there is suppression. The clinical appearance of the patient, therefore, is, as it were, a combination of the appearances in pernicious anæmia, catarrhal jaundice and acute parenchymatous nephritis.

Treatment. *Medical.*—There is no specific drug for the cure of this disease, and the rôle of the doctor is largely one of guarding against complications, together with judicious stimulation. One of the most dreaded and most frequent complications is suppression, against which the best treatment is to give the patient as much alkali as possible. The doctor may give this as intravenous injections of bicarbonate of soda, 150 grains to the pint or 17 grams to the litre, and may order large doses of potassium citrate and also the addition of a

pinch of bicarbonate of soda to all feeds. When the vomiting is severe, nourishment may be given intravenously in the form of glucose, 5-per-cent. solution. The nurse should know, however, that while solutions of glucose and bicarbonate of soda may be mixed at less than boiling heat, they cannot be boiled up together without chemical change. Each solution, therefore, must be sterilized separately. Blood transfusion may be required (p. 158).

Nursing.—Upon good nursing rests the patient's greatest chance of recovery, and the nurse should remember that, while no patient is ever so ill that he may not recover, equally no attack is ever so light that death is not imminent; therefore no risks whatever must be taken nor must vigilance be relaxed for a moment.

From the onset the patient must be put to bed between blankets, hot bottles being provided. He must be nursed lying flat on his back, except in pneumonic complications. Sitting up may be followed by fatal syncope, therefore the nurse should keep her patient flat until definite instructions to the contrary are given by the doctor. Perspiration is profuse, and from time to time the patient must be changed and dried, with as little movement or exposure as possible. The room should be kept warm but well ventilated, and if there are two attendants the patient should never be left alone.

The diet should be the lightest and most nourishing possible—milk, junket, custard, jellies or chicken-tea being the most suitable. Copious supplies of water or barley-water should be given. Stimulants, such as brandy or champagne, may be given by the doctor's orders or at the nurse's discretion. Record the time and amount of everything taken. Sponging the face with warm water to which a little toilet vinegar or eau-de-Cologne has been added is very soothing, but

no reduction of temperature by sponging should be attempted unless hyperpyrexia occurs and the temperature exceeds 107°F., and even then the temperature must only be reduced a very little. Attention to the mouth is important. A good soap enema should be given at the onset, and enemata used later as required, without exhausting the patient.

Record the temperature, pulse and respirations every two hours. Vomiting is best relieved by a teaspoonful of sodium bicarbonate in a tumblerful of warm water, and a mustard leaf to the epigastrium. The same may be done for hiccough. A preventive inoculation is effective.

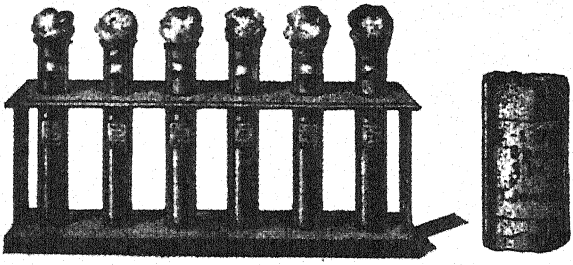


Fig. 1—Illustrating method of saving specimens of urine from a blackwater-fever patient. (*Orig.*)

For cardiac weakness, strychnine, digitalin, or camphor in oil may be used, and it is well to raise the foot of the bed. Anuria is met by alkaline drinks, fomentations to the loins, or dry cupping (p. 171). Hot (120°F.) colonic lavage and intravenous injections may also be used. Do not pass a catheter unless the bladder is distended; in suppression it is the kidneys which fail to function and the fault is not with the bladder.

From the very start of the illness measure the amount of urine, and put up in a series of test-tubes a sample of

each specimen of urine passed, recording on a label on each tube the date and hour at which the specimen was passed and the amount (Fig. 1). The progress of the disease can then be gauged at a glance.

CHOLERA

Cholera results from an acute intestinal infection. It occurs chiefly in epidemics in or starting from India, which may be considered the home of the disease.

Cause.—The actual cause is a small bacillus, the cholera vibrio, which is taken into the system with food and drink; but there are predisposing causes such as age, bad health, fear, etc., which so upset the normal gastric secretion that it fails to destroy such bacilli as may be swallowed, thus permitting them to gain entrance to the small intestine. A healthy adult with good digestion is not so liable to infection.

Pathology.—The bacilli cause intense poisoning, or toxæmia, and irritation to the intestine, resulting in such loss of fluid from the body that the blood becomes reduced in amount and so thickened that circulation can barely be maintained. Because of this loss of fluid from the blood the cells are relatively increased in numbers, so that a blood-count may show seven or eight million red cells per cubic millimetre and a leucocytosis of 15,000 to 50,000 (p. 153).

Clinical course.—For purposes of description the course of the disease may be divided into three stages—the onset, the algid stage, and the reaction.

The onset.—The onset is usually sudden, though there may be some preliminary diarrhœa and a feeling of depression. Then profuse diarrhœa comes on, the patient passing in rapid succession copious fluid motions, as though he were evacuating a succession of enemata.

The motions at first contain fæcal material, but soon this is all evacuated, the efflux becoming purely watery and cloudy with little white specks of mucus floating in them, resembling water in which rice has been swilled, and forming the characteristic "rice-water stools."

There is no tenesmus, or straining, with the motions; indeed, there is almost a sensation of relief at the evacuation. Complete prostration occurs at once, and soon severe cramping muscular pains begin in the legs or even throughout the whole body. These are of agonizing intensity, the affected muscles standing out rigidly and causing the patient to scream out with the severity of the suffering. The body soon becomes shrunken, so that the skin sags loosely and looks lifeless and ridgy, especially the hands, which look as if they had been long immersed in water—the "washerwoman's hands." The face is pinched and hollow, the eyes are bloodshot and sunken, the tongue and mouth dry, and the patient is consumed with thirst. At this stage, vomiting may reinforce the drain on the body fluids started by the diarrhœa. The vomit likewise acquires the rice-water appearance.

The algid stage.—The skin now becomes more dusky and bathed in a cold, clammy sweat; the patient becomes totally helpless and lies in bed moaning feebly or whispering huskily, cold, and practically lifeless. The pulse is feeble or absent and, because of the low blood-pressure, anuria is usually present. The temperature of the body surface is very low, perhaps down to 90°F., but the rectal temperature is usually raised.

At this stage the patient is likely to die from toxæmia and collapse with circulatory failure, or may do so a little later from uræmia. The death-rate in cholera is something over 50 per cent.

Stage of reaction.—If the patient survives, the vomiting and diarrhœa lessen, and recovery slowly sets in. The

skin becomes warm, or even hot and flushed, and the shrunken appearance gradually disappears. The subnormal temperature is replaced by some degree of fever, and the pulse can once more be felt at the wrist. Intense thirst still persists, and it is some hours before the urinary secretion is restored. Once the reactionary fever has settled down, the patient makes a surprisingly rapid convalescence.

Treatment. *Medical.*—Hypertonic saline given freely by the intravenous route is frequently used. The veins are so collapsed that it is necessary to expose one by an incision before the injection can be given.

A mixture containing oil of cloves, oil of cajuput, and other essential oils is used with good effect. Pills containing potassium permanganate are given as an intestinal disinfectant, and injections of atropine are used to prevent collapse.

Nursing.—The patient is nursed flat in bed. The first thirty-six hours or so are devoted to keeping him warm with hot bottles or bricks, and to giving by mouth continuously hot water containing a little bicarbonate of soda or calcium permanganate. With permanganate the stools assume a greenish colour. No food at all is given. The patient has to be kept almost continuously on a bed-pan, and the nurse should remember that both the stools and the vomit are teeming with the germs and are highly infective, while the vomiting is sometimes so sudden that a gush of fluid may be shot over an unwary attendant. Cramps may be relieved by friction and warmth. Record the amounts of urine passed. Dry the body from time to time with a hot towel. Take the temperature in the rectum, and pay close attention to the pulse. Get ready the intravenous apparatus (p. 166). When the worst stage is passed nourishment may be given in the form of albumen-water and barley-water,

then milk and barley-water, gruel, etc., until the diet is very gradually built up.

Prophylaxis.—The patients should be quarantined, but this alone can never be very effective, because, during an epidemic, there are always carriers of the infection who are not themselves ill; while convalescent patients may continue to pass infective motions for upwards of two months. Sunlight and drying quickly kill the germs, but they can live for some time in the presence of moisture. Soiled sheets and bedding must be placed in disinfectant and allowed to soak; 5-per-cent. creosol is satisfactory. Only such old mattresses or temporary palliasses should be used as may be afterwards burned. Every possible measure must be adopted to get rid of flies, as these are a source of great danger. The water supply must be guarded from infection and treated with potassium permanganate, while that for domestic use should be boiled. Patients' utensils must be kept apart from those of the attendants.

When handling the patient, wear gloves if possible, and be well gowned. Gowns must be removed before quitting the patient's room, and the cleanliness of the nurse's hands must be assured before meals. Any habit of fingering the lips or biting the nails is more than likely to lead to infection. The nurse must look after her general health, making full use of her time when off duty to get fresh air, exercise and rest.

Diarrhœa, however slight, during a cholera epidemic must at once be reported to the doctor.

CLIMATIC BUBO

A peculiar sub-acute swelling of the groin lymphatic glands is found in some parts of the tropics, more especially in West Africa. The condition is of venereal origin, the infecting organism being a filterable virus.

Clinical course.—In the male the primary lesion is a small papule or blister resembling herpes, found on the genitals, but this soon disappears and is so insignificant as often to pass unnoticed. Later, fever usually develops, and a tender swelling appears in one or both groins. The condition is a sub-acute gland infection accompanied by general fever and malaise. Eventually an abscess may form and burst, leaving an ulcer which may take months to heal. In females the infection may lead to ulceration and stenosis of the vagina, with fistulæ, and even to similar trouble in the rectum.

Diagnosis.—A correct diagnosis can usually be made on clinical grounds, but it can be confirmed by an intradermal test, the Frei-Hoffmann reaction.

Treatment.—Formerly, when pus accumulated it was usual to evacuate it through an incision, but the resultant wound took so long to heal that this method was anything but satisfactory. It is better to aspirate the pus, repeatedly if necessary, and thus avoid a secondary infection. At the same time, the general health is improved as much as possible and protein-shock treatment given (p. 168). Such measures now cure the condition in a short time. Sulphanilamide is helpful.

DENGUE

Dengue is a fever, spread by mosquitoes, and somewhat resembling measles. The actual cause is a filterable virus. The disease has a fairly widespread distribution in hot countries, and is especially prevalent in river and coastal areas. It is particularly apt to occur in great epidemics which, fortunately, are attended by a very low mortality rate.

Clinical course.—This may be described in three

stages—the initial fever, the remission, and the terminal fever.

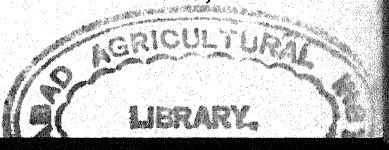
The initial fever.—After an incubation period of a few days, the disease begins suddenly—especially so in children—with a high temperature, severe headache, pain in the eyes, and dreadful joint pains which are increased on movement. In young children a sudden attack of convulsions is frequently the first sign of the illness. There is a deep flush on the face and neck, or perhaps on the whole body, coming on quite early in the attack and resembling the rash of scarlatina; the throat, too, is congested and sore, but there is not the intensely painful throat of that disease, which is rare in the tropics. The eyes are congested and the face is swollen, giving the patient a bloated appearance, as in yellow fever, but the absence or scantiness of albumin in the urine helps to distinguish dengue from the graver disease.

The patient is very depressed and becomes completely prostrate in a few hours, lying quiet because of the agony of movement. There is a rapid pulse with a high temperature, and a hot, dry skin, and the tongue becomes furred and dry. There may be vomiting.

The condition gradually improves, and about the third day the temperature returns to normal and the symptoms disappear.

The remission.—There is now an interval of two or three days without fever, during which the patient feels almost well, and all the flushed appearance has gone. The pulse becomes slow.

The terminal fever.—At the end of this interval the temperature rises for about a day and is accompanied by the true dengue rash. This rather resembles the rash of measles, but may be so slight that it can be detected only by careful search. Starting on the hands, it rapidly spreads up the forearms to the neck and face;



then the feet, ankles and legs are affected, and lastly, the body and thighs. It disappears in a day or two, in the order of its appearance, being followed by desquamation or peeling. By the time it appears the pulse has become very slow—well below the normal rate. A white blood-count shows a marked leucopenia. With the terminal fever, too, the pains return in some of the joints, and may persist for a very long time; these second pains are usually slight or absent in children.

Sleeplessness and general depression or irritability, marked throughout, persist well into convalescence, which may be very protracted. Relapses, while not uncommon, are not severe. Enlargement of the lymphatic glands sometimes occurs in children, but without suppuration.

Diagnosis.—In an epidemic the diagnosis is obvious, but in isolated cases it is difficult, especially in children. The disease, however, is usually typical, the preliminary scarlatina-like flush, the pains, the remission, and the terminal rash being characteristic. The absence, or the presence of only a slight amount, of albumin in the urine is in contrast to the great amount in yellow fever. The absence of chest symptoms and the slow pulse help to distinguish dengue from influenza.

Treatment.—No curative drugs are known, and the disease has to run its course like the other specific fevers. The patient should be in bed for the first and terminal rises in temperature, but may be allowed to sit up in his room during the remission. When the temperature is high, cold sponging is required, and cold should be applied to the head. Hot flannels or stupes may ease the painful joints. Tepid sponging of the body and cold applications to the head may be used for a child with convulsions. The diet should be fluid and scanty at first, afterwards light and nourishing. Plenty of fluids are required. The doctor may order some cool-

ing or soothing medicines but, if his attendance is delayed, the nurse may give aspirin or phenacetin to ease the initial symptoms.

An aperient should not be given during the first few days when the stiffness and joint pains are most marked, as any attempt to move the patient on to a bed-pan will cause much pain. Rubbing and massage may be required during convalescence, which is shorter in children than in adults.

Prophylaxis.—As infection is conveyed by mosquitoes, measures taken against these pests (*see* p. 106) are the only means of checking an epidemic.

DERMAL MYIASIS

By dermal myiasis is meant any form of skin infection which is directly caused by flies or their larvæ. There are several varieties, some of which are little more than a nuisance; others are a grave menace to life.

The Screw-worm Fly

This fly is common in America and causes harm by depositing its eggs, during the hot part of the day when the victim is asleep, in the nose or ear. It is particularly likely to do so if there is any offensive discharge. Indeed, the eggs are readily deposited upon any part of the body where there may be an exposed sore. The fly lays some 300—400 eggs; these hatch out in a few hours into small maggots which promptly burrow deeply into the tissues beneath; and, as they can penetrate bone quite easily, nothing stops their advance. They cause intense suppuration and pain and, if they penetrate to any vital organ such as the brain, cause death. If a less vital part be attacked, the larvæ come

to the surface again when mature and the wounds gradually heal, but until then the risk of blood-poisoning and death are considerable.

Treatment.—Patients should be screened during the heat of the day, and no raw area of the body left uncovered. Should a fly be detected on a patient, immediate search must be made for eggs, which must all be removed with care, and the part cauterized. Once the larvæ have burrowed below the surface, treatment is that of any septic wound. The doctor may use chloroform as a local application.

Other flies can cause similar nasal, aural, or even ocular infections in Southern Europe, Asia and Africa.

The Mosquito Worm

Another type of infection occurs in South America from a fly whose larva is commonly known as the *mosquito worm* or *ver macaque*. If one of the eggs of this fly be deposited upon a person's skin or clothes, it sticks there until the hatching of the larva, which bites its way into the skin and remains just below the surface until it is mature or is extruded by suppuration. The larva is about half-an-inch long, and causes a form of boil which may occasion great pain and inflammation.

In Africa the *tumbu fly* gives rise to a similar larva which hatches out on the floor and attacks people lying or squatting on the ground, penetrating the skin and producing a similar result to the ver macaque.

Treatment.—The opening at the top of the "boil" is enlarged and the maggot gently extracted; fomentations are then applied.

The Creeping Eruption or Larva Migrans

The condition known by these names is found in

Russia, Ceylon, Africa and other places. It is produced by the tiny larvæ of a fly or a small worm which burrows along in a zig-zag manner leaving a bright-red wavy line on the skin, marking its course. The condition is harmless and will in time disappear.

Treatment.—A portion of skin at the advancing end of the line may be excised, so removing the parasite, or more simply the skin may be frozen by an ethyl chloride spray, so killing the parasite.

Intestinal Myiasis

A nurse in the tropics may be not a little perturbed and disgusted to discover many maggots crawling through a freshly-passed stool. The maggots of certain flies in the tropics have the ability to hatch out and live in the intestine if the eggs have been swallowed with food. A dose or two of castor oil will probably get rid of these unpleasant companions.

DHOBIE ITCH

This is a somewhat loosely-applied name for any itchy condition of the skin which is not prickly heat or other recognized skin disease. Used more particularly, it designates a form of ringworm which occurs especially in the crutch and axillæ. Not infrequently, too, it will be found between the toes.

The condition is very characteristic, as the nearly circular or semi-circular patches of reddened, scaly and inflamed skin, together with the excessive irritation, can scarcely be mistaken.

Treatment has to be carried out drastically and carefully. All underclothing should be boiled, and the

seams of the outer clothing pressed with a hot iron at the armpits and crutch.

The patient should take a bath, thoroughly washing the affected parts. After this, Vleminckx's solution, containing calcium sulphide, should be applied on lint, diluted if necessary. This process is repeated daily for four or five days, when the condition will be cured. Any sign of recurrence is promptly met by the same measures.

Should the skin be very inflamed, a soothing ointment will be found useful as a preliminary treatment, for example, ammoniated mercury ointment 1 part, zinc ointment 3 parts.

Cleanliness and the use of powder after a bath are the best protection.

THE DYSENTERIES

Definition.—"Dysentery" is the name given to a group of symptoms, of which the chief are diarrhœa with blood and mucus, and griping abdominal and rectal pains known as tenesmus. Strictly, therefore, dysentery is not a disease, but a pathological condition which can be produced by a large number of diseases. This will be clear to the nurse if she realizes that tenesmus and diarrhœa with blood and mucus, *i.e.* "dysentery," may result from the following causes:

Mechanical.	Foreign bodies in the rectum. Swallowing glass or sand.
Circulatory.	Hæmorrhoids.
Inflammatory.	Gonorrhœa. Tuberculosis. Syphilis. Ulcerative colitis. Bacillary and amœbic infections.
Parasitic.	Bilharzia infection.
Malignant.	Cancer of the bowel.

This list is by no means exhaustive, but will suffice to show the variety of causes for dysentery.

In connexion with tropical medicine, however, there is such a preponderance of dysentery due to amœbic or bacillary infection of the bowel that the word dysentery is used loosely to designate the diseases caused by these organisms (cf. elephantiasis). Even then the term is vague and should not be so employed: each condition ought to be defined clearly as "amœbic dysentery" or "bacillary dysentery." Insisting upon the correct name for every case of "dysentery" ensures a complete diagnosis, without which treatment may be dangerous or at best haphazard. When the nurse reflects that patients with cancer of the rectum are occasionally encountered to whom, alas, treatment for "dysentery" has been given for months, even for as long as two years, she will realize the danger of this lack of precision in diagnosis and nomenclature.

Amœbic Dysentery

This disease is widespread in the tropics and subtropics and causes much disability.

Cause.—The cause is a microscopic organism, *Entamœba histolytica*, which can live in water or foodstuffs. When exposed to adverse conditions the amœba can surround itself with a protective wall, forming what is called a cyst, and can then remain alive in water or damp soil for a considerable period.

Infection.—This results from cysts taken in through the mouth, frequently from contaminated water or infected food. Flies often convey the amœbic cysts from the latrine.

Another source of infection of considerable importance exists in human beings who have at some time had

amœbic dysentery and have not been cured, and thus continue to pass amœbic cysts in their motions; or in people who may harbour the organism in the bowel without ever having suffered from dysentery; it must be clearly understood that such persons exist. These human sources of infection are known as *carriers*. Obviously, to have a carrier handling food in kitchen or larder is to court disaster. Unfortunately, the only way by which a carrier can be detected is by having a series of his motions examined for the parasite.

Men and women are both liable to infection, but the disease is rare in young children.

Pathology.—The infecting amœbic cysts, taken in by the mouth, pass through the stomach and small intestine unharmed; on reaching the large bowel they become active amœbæ. They then burrow into the bowel wall, forming minute ulcers in which they rapidly multiply. The young amœbe make their way up and down the bowel, forming more ulcers here and there, so that shortly the whole of the large intestine is swarming with amœbæ and dotted all over with ulcers, varying in size from the microscopic to the size of a finger-nail, with a very ragged outline.

The portions of bowel wall between the ulcers are healthy, but the mucous lining of the whole large bowel becomes redundant, with the result that prolapse of the rectum and hæmorrhoids may occur. The irritation which the amœbæ set up in the colon causes the excess of mucus, while the blood, of course, comes directly from the ulcers. The irritation also causes excessive peristalsis, which in turn gives rise to the griping pains. The stools consist of fæcal material mixed with much blood and mucus, and contain numerous living amœbæ. In chronic cases the ulcers are few and cysts of the amœbæ are found in the motions.

Clinical course.—The onset is sudden, with

diarrhœa and abdominal pain; some mucus and blood appear in the stools, and in bad cases there may be very many motions daily. The severe pain and straining soon prostrate the patient. There is, however, no toxæmia or rise in temperature; the condition, as the pathology indicates, is purely a bowel cataclysm. Without treatment, it may be prolonged and disastrous, eventually, if the patient survive, becoming chronic. With treatment, the symptoms rapidly abate, the effect of emetine being magical; but the percentage of those permanently cured by one course of treatment is not high, as relapses, usually less violent, are not uncommon.

Complications.—*Perforation* of the large bowel occurs, but fortunately is rare, as the resulting peritonitis is likely to prove fatal. The only hope of saving life lies in immediate laparotomy followed by emetine treatment.

Hæmorrhoids are frequently found, especially in chronic cases.

An *amœbic abscess* may occur, in rare cases, in the brain or spleen, and is not then likely to be diagnosed during life. The formation of an abscess in the liver, however, is so common that it will be described in a separate section.

Muscular weakness, cardiac weakness, and a feeble pulse result from vigorous emetine treatment.

Diagnosis.—The diagnosis of amœbic dysentery can be arrived at in three ways:

1. *Clinical.*—This can be of use only in *acute* cases. The sudden onset, the absence of fever, and the absence of toxæmia, with dysenteric symptoms, suggest an amœbic infection. If emetine be now given, and it causes rapid cessation of symptoms, the diagnosis may be regarded as fairly certain, but not assured.

2. *Sigmoidoscopic.*—This method is the one of choice for *chronic* cases, being unnecessary in acute attacks. The sigmoidoscope consists of a metal tube into which

a solid pointed part, the obturator, can be fitted to facilitate insertion into the rectum (Fig. 2). Once this is done, the obturator is replaced by a thin rod carrying an electric lamp which is connected to a small battery. A glass eye-piece is fitted over the end of the tube, and a rubber bellows attached to a side nozzle. Thus, by direct vision, the doctor can pass the sigmoidoscope gently about twelve inches into the bowel, observing any ulcers or other lesions of the gut wall.

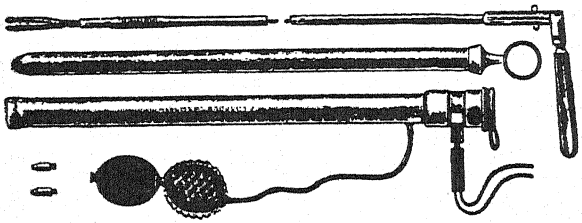


Fig. 2.—Sigmoidoscope. (Scale ½, approx.)

The appearance of the bowel thus examined may, to an experienced eye, suffice for a diagnosis. If not, scrapings may be taken by a long-handled spoon or forceps, smeared on a slide, covered with a cover-slip and forthwith examined under the microscope for amœbæ. By this method, amœbæ will be detected frequently, although all previous stool examinations may have been negative.

Before use, the sigmoidoscope is sterilized by boiling, with the exception of the light attachment, which is placed in an antiseptic lotion, and after use the instrument is carefully cleaned and re-sterilized before being put away. Some lubricant is required for the introduction, and a finger-stall should always be provided. Small pledgets of cotton-wool should also be made ready, as well as slides and cover-slips.

3. *Microscopic.*—This is the correct method for obtaining the diagnosis in acute cases, and should be used in addition to the sigmoidoscope for chronic cases.

The diagnosis is made by finding the amœbæ or cysts in the patient's stools, repeated examinations being necessary in some cases. When instructed to save a stool for examination, the nurse should take care that urine is not mixed with the motion. It should be collected in a bed-pan, the toilet paper removed and the pan sent at once to the laboratory, or the stool first transferred to a suitable receptacle, as may be required. If only a small portion of the stool is to be sent, the nurse should select, if possible, a portion which contains mucus and blood.

It is essential, however, that no antiseptic be added, and that the stool be as fresh as possible; an old specimen is valueless. The patient's name should be marked on the bed-pan immediately before it is used, so eliminating chances of error.

Treatment.—Rest in bed and a saline purge are indicated at the outset, and the doctor may order a little opium. The diet should be very light—practically of milk, and oral hygiene must receive careful attention. *Emetine* injections will almost certainly be ordered. They are given with the usual precautions to ensure sterility, either deeply subcutaneously or into a muscle (p. 165).

The dose for one injection is usually one grain, and the injections are given daily for twelve days. Occasionally two injections are given in one day. The pulse must be watched carefully throughout the course. Until the emetine takes effect, turpentine stupes (p. 169) applied to the abdomen may give some relief.

The stools, if not required for examination, should be disinfected, and the nurse should be careful of her hands, especially when dealing with a chronic case.

OTHER DRUGS EMPLOYED.—*Emetine bismuthous iodide*, popularly known as E.B.I., is a red powder usually given as a 3-grain dose in a gelatine capsule. It is used for chronic or relapsing cases, for which it is superior to emetine. The drug is given at bedtime and, as it creates great nausea, salivation and frequently vomiting, the nurse should know exactly how it may be best administered. The patient should be in bed throughout the course, which lasts for twelve nights, on a very light diet, consisting chiefly of milk, though an egg or a little fish may be allowed. Starchy foods, like bread and potatoes, should be restricted. The last feed should not be later than 6 p.m., and the drug should be given at 10 p.m. when the patient has been settled for the night. There should be a low pillow, and the patient should be instructed to lie very quiet after taking the dose; movement induces vomiting. A kidney tray should be provided so that the patient can get rid of any saliva without raising his head. A mustard leaf applied to the epigastrium is sometimes useful. The nurse should carefully examine any vomit for bright-red E.B.I. and report on its presence or absence.

Some patients are less tolerant of E.B.I. than others, and in the troublesome cases the doctor may order some tincture of opium with, perhaps, a dose of bismuth to be given half-an-hour before the capsule. Towards the end of the course, the pulse becomes very small and soft, as the heart is weakened, and the nurse must see that the patient lies quiet in bed all the time. Diarrhœa, with fluid greenish-yellow motions, is very common during treatment, and the nurse should report it, though little harm will come of it unless the number of motions becomes excessive; in fact, it is probably beneficial, and will stop as soon as the treatment ends.

Once the course of E.B.I. is finished, the patient can take a light diet of milk puddings, eggs, bread-and

butter or toast, jellies (but not jam), potatoes and the finer vegetables, baked apples, bananas, boiled white fish, chicken, and so on, the diet being gradually increased, always avoiding such foods as will pass through the large bowel in gritty or undigested form. Constipation is a common sequel and is best met by abdominal massage, more water, more fruit and, if necessary, some lubricant such as petrolagar.

Alcohol is forbidden in all stages of amœbic dysentery.

Yatren or *chiniofon* is a yellow powder which can be given by mouth in tablets; or as a golden-yellow solution of 2-per-cent. strength for rectal injection to be retained, the bowel being previously washed out with a solution of sodium bicarbonate. Green diarrhœa is a sign that the drug is being pushed to the limit of the patient's tolerance, so it must be promptly reported. This drug can be used singly, or in combination with emetine or E.B.I. *Stovarsol* and *carbarsone* are also used.

Prophylaxis.—The disease should be preventable if care is taken to protect all food and water from contamination by dust, insects or human beings, and in this connection the rôle of the native servants as carriers must be remembered. Impure well water and raw vegetables are a frequent source of infection.

Hepatitis and Liver Abscess

Although mentioned separately, these conditions are complications of amœbic dysentery, and may come on at any time during the course of the disease, or long after the dysentery has ceased.

Hepatitis

In hepatitis the liver is enlarged and tender, the appetite impaired, and a swinging temperature is

accompanied at the remissions by profuse perspirations. A slight increase of leucocytes may be present. The condition comes on fairly suddenly and increases in severity for a few days, after which it either gradually improves or passes on to the formation of an abscess.

The inflammation is caused by the presence of amœbæ which have been swept along the blood-vessels coming from the bowel ulcers in the region of the cæcum, up to the portal vein and so into the liver substance.

Treatment.—Rest in bed with light diet is indicated. A dose of calomel followed by saline is given at the outset, and emetine injections started as soon as possible.

Local applications to the painful region may be turpentine stupes, thermogene wool or antiphlogistine; but poultices should not be used as they render the skin unsuitable for surgical procedures. Frequently it is impossible to differentiate between hepatitis and liver abscess, and in such cases the doctor makes a few exploratory punctures, under local or general anæsthesia.

Amœbic Liver Abscess

This condition, commonly spoken of as liver abscess, although, of course, it is not the only form of abscess of the liver, is a terminal stage of hepatitis. We do not know why, in some patients, nothing more comes of the amœbic infection than hepatitis, while in others abscess formation rapidly takes place. It is certain, however, that excessive consumption of alcohol predisposes to abscess formation, because the condition is uncommon among races and individuals who do not take alcohol. In general the symptoms resemble those of hepatitis, but are more marked and more definitely localized. The liver enlarges mainly in one direction, generally upwards, and the tenderness is likely to be

localized. There may be some œdema over the most tender area.

The general condition is poor, the patient having no appetite, a dirty tongue, a temperature of 101°–104° F. and a pulse of 90–120. The face has a sallow, leaden colour. The respirations vary with the site of the abscess; if it be in the upper part of the liver it presses up against the diaphragm and causes some embarrassment of respiration, often pleurisy, and even basal pneumonia. Occasionally the chest complications will be so severe as to draw the attention away from the true cause of the condition.

There is usually a leucocytosis of about 20,000.

While this is a description of a typical case of liver abscess, the signs and symptoms vary enormously, and a huge abscess may be present without pain or many of the other symptoms.

The abscess is usually in the right lobe, occasionally in the left lobe, and sometimes more than one abscess is present.

Terminations:

1. Under treatment the abscess may disperse.
2. The abscess may be evacuated surgically.
3. The abscess may burst and discharge itself, resulting in:
   (*a*) Spontaneous cure.
   (*b*) Chronic discharging sinus and ill-health.
   (*c*) Death.

Reference to Fig. 3 will show the directions in which the abscess may burst.

Treatment.—The patient is kept in bed on a very light diet. Local applications as for hepatitis may be used. The urine should be measured and tested. The patient must be changed and made comfortable after

the heavy sweats. Attention should be paid to the cleanliness of the mouth. Emetine injections will usually be ordered and, if the symptoms do not rapidly abate, an operation will be necessary. This may be done under general or local anæsthesia, either in the theatre or

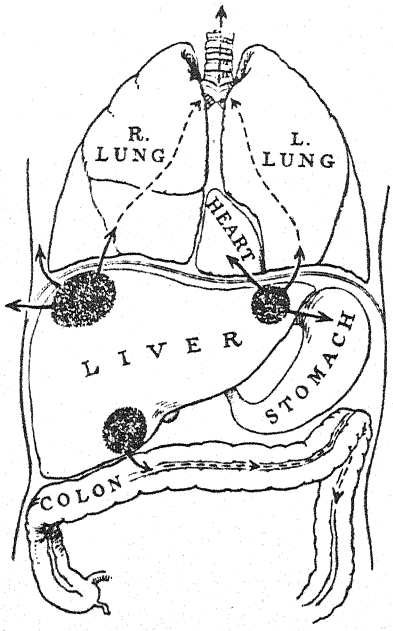


Fig. 3.—Diagram showing the directions in which a liver abscess may burrow and burst. (*Orig.*)

in bed if the patient be very ill. The operation will be one of two types: either exploratory puncture and aspiration, or exploratory puncture and open drainage.

EXPLORATORY PUNCTURE AND ASPIRATION

Instruments:

Two Record syringes of about 20–30 c.c. capacity.
Two stout needles, 3½–4 ins. long to fit the syringes.
A narrow-bladed scalpel.
A Potain's aspirator in good working order.

The patient's skin over the whole liver region is prepared with some antiseptic and the nurse must realize that aseptic precautions are just as necessary for this operation as for a laparotomy.

The surgeon will usually endeavour to locate the pus by syringe and needle; several punctures may be required. When pus is detected, the exploring needle is left *in situ*, a tiny scalpel puncture is made in the skin near by and a Potain's trocar and cannula introduced through this, aiming to hit the point of the needle and so enter the abscess. When aspiration is under way the exploratory needle is withdrawn. The pus may be so thick that the cannula becomes blocked, and may from time to time have to be cleared by the blunt trocar, but a more common stoppage is due to blood clotting in the rubber tube or in the tap connection. The process of aspiration may be lengthy, so that, if possible, spare parts should be ready to avoid delay. Fortunately, a Record syringe will just fit the bore of both the tube and tap attachment, so that the nurse can rapidly clear away the obstructing clot by simply forcing through some sterile lotion. At all times when aspiration suddenly stops, the nurse should be ready to ascertain that it is not the apparatus which is at fault.

After the operation a light dressing is applied, and the patient firmly swathed in a many-tailed bandage and kept quiet. Morphia may be ordered before or after the operation. Careful check on the pulse should be kept for the next twenty-four hours lest hæmorrhage occur,

and the patient should not be moved more than can be helped.

The diet should not be increased until the temperature has settled down. The emetine injections should be continued without interruption. The puncture wounds should not require any more dressing. A second aspiration may be necessary.

EXPLORATORY OPERATION AND OPEN DRAINAGE

Instruments:

Two Record syringes and needles as before.
General instruments for opening any deep abscess.
Periosteal elevator and rib shears.
Retractors and long sinus-forceps.
Curved cutting and smooth needles.
Catgut and S.W.G.
Rubber drainage tubes of various sizes.

When pus has been located, the surgeon cuts down on the abscess, if necessary removing part of one or two ribs and suturing the diaphragm and pleura to protect the lungs. A drainage tube is inserted, copious dressing applied and the patient returned to bed. The dressings must be changed frequently and with the utmost aseptic precautions. They should be of sterile gauze or cloth, and should be wrung out of an antiseptic solution. The great danger lies in the risk of secondary organisms reaching the liver, which can deal satisfactorily with the amœbæ alone, but not with additional germs. Because of this danger, which in the tropics is a very real one, the open operation is being less and less used.

Bacillary Dysentery

This disease occurs in isolated cases all over the tropical and sub-tropical world, but at times is liable to epidemic outbreaks with a fairly high mortality.

Cause.—The disease is caused by a group of bacilli, the dysentery bacilli, of which there are two principal types: Shiga and Flexner-Y. Shiga infection produces the more serious and more toxic disease, but from a nurse's standpoint there is no object in separating the group—it suffices that bacillary dysentery is caused by *Bacillus dysenteriæ*.

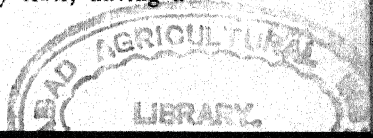
Infection.—Infection is acquired exactly as in typhoid, that is, taken in through the mouth. Patients' stools are highly infective, and flies or dust may convey infection from the latrines to foodstuffs; the water supply may become contaminated, or the nurse's hands may convey the germs. Carriers of the germs also are a source of danger.

Pathology.—The bacilli multiply in the large bowel, where they cause acute inflammation, ulceration, and bleeding of the mucous membrane. Later there is secondary infection of the ulcers and pus formation. The poisons from the germs and from the bowel contents are readily absorbed into the system, causing general toxæmia, fever and wasting. In severe cases the lower part of the small intestine is also affected, and large portions of the gut become necrotic or gangrenous.

Clinical course.—At the onset the disease may be mild, acute or fulminating, and later it may become chronic.

A mild attack amounts to a bout of diarrhœa, with the passage of mucus and perhaps a little blood, accompanied by headache, lassitude, anorexia and a dirty tongue. The condition is important only because it may become chronic, and because the person's motions are infective.

An acute attack comes on fairly suddenly, with a chilly feeling and abdominal pain, tenesmus, and very bad diarrhœa, with passage of blood mixed with thick glutinous mucus. The victim is very *toxic*, having a



headache, intense thirst and a dirty tongue, and showing a rise of temperature; occasionally this is marked and delirium occurs. The sufferer is obviously very ill and soon becomes exhausted and thin, losing flesh very rapidly. With treatment, the acute condition clears up in about a week, the patient frequently making a good recovery, though a few cases, unfortunately, relapse or become chronic.

A fulminating attack comes on like a thunderclap, the patient being overwhelmed by the toxæmia from the outset. There may be vomiting and a rigor with a high temperature, which later becomes subnormal. The motions are nearly continuous, consisting of almost pure blood and mucus, teeming with dysentery bacilli. Later, the blood may be replaced by pus and sloughs. The toxic absorption may become intensified and the patient die in a few days. Sometimes the symptoms resemble those of cholera. From such attacks patients rarely recover.

Complications. 1. *Arthritis.*—This complication may come on at any stage of the disease and attack any or every joint in the body. The affected joints are inflamed and distended with fluid. The condition can be extremely painful, and may become permanent. Treatment consists of rest, bowel lavage, local applications and vaccine therapy. Later, massage and protein-shock (*see* p. 168) may be of use.

2. *Dysuria.*—During the acute stage of the disease micturition may be very painful. When the patient is only partially conscious, the nurse must see that retention does not occur.

3. *Bed sores.*—These the nurse must do all in her power to prevent, but in bad chronic cases it will tax her capabilities to the utmost.

4. *Inflammatory eye lesions and parotitis* also occur, and little or no reading should be allowed during convalescence.

Treatment. *Medical.*—At the earliest possible moment the doctor is likely to order sulphaguanidine. This comes in the same category as sulphapyridine ("693") but is less readily absorbed from the gut and so collects in greater concentration in the bowel. It is given by mouth in large doses at first, perhaps 1 grm. per kilogramme of body weight 4-hourly, until the number of stools is markedly reduced; then half the quantity is given. In specially toxic cases, anti-dysenteric serum is also administered; for this a large syringe should be made ready.

Nursing.—The patient should be kept warm in bed. Any glare must be excluded, but not the fresh air. If the bed-pan is too exhausting, pack around the patient's buttocks wool, tow or rags, burning these and washing the patient every four to six hours. In the early stages of an attack, washing out the bowel by an enema of 2–3 pints of normal saline may give some rest. A hot bottle, or a turpentine stupe, eases the abdominal pain. The patient should be disturbed or moved as little as possible.

Take the pulse frequently and, if it is failing, an injection of digitalin or camphor in oil may be ordered by the doctor. Alcohol should not be used as a stimulant.

Perforation is not so likely as in amœbic dysentery, but large portions of the bowel may become gangrenous, for which condition nothing, of course, can be done.

Diet.—At first the diet should consist mainly of water, given, as it must be, in copious quantities. It can be made nourishing as albumen-water or barley-water, and a little bicarbonate of soda should be dissolved in it from time to time. Jellies and clear soups may also be given. Milk, however, is not well tolerated. As the symptoms abate the diet is extended, for the patient's general condition must be maintained at as high a level as possible. Alcohol is not allowed.

Chronic Cases

Bacillary dysentery in its chronic form is a distressing and intractable condition which may follow a mild or, more rarely, an acute attack. For months or years the patient suffers from loose motions, perhaps two to four daily, with occasional "attacks" when their number increases, varying from six to nine, and mucus or blood is noticed. Other symptoms are loss of weight, loss of appetite, anæmia, a constantly coated tongue, headaches, and entire absence of the feeling of well-being. Gradually the "attacks" become more severe and prolonged until the patient may have from five to ten motions daily, consisting chiefly of mucus and blood. The combination of chronic toxæmia and loss of blood results in great anæmia.

Treatment.—Chronic cases require treatment on a plan directed towards eliminating toxins, building up the patient, and healing the bowel.

Medical.—Sera and vaccines are of little use. Sulphaguanidine is less reliable than in acute cases. Bismuth, if used, will, like iron, turn the motions black.

Dental treatment, if required, should be prompt.

Iron and arsenic injections are sometimes used for the anæmia; bowel lavage, with saline, bicarbonate of soda or eusol is sometimes useful, and hosts of other preparations for irrigation are used. Chiniofon has also been found to do good; but in the worst cases appendicostomy, or even cæcostomy, is required.

After appendicostomy, bowel lavage is carried out through the appendix stump and, if yatren is thus used, a 1-per-cent. solution will probably be sufficiently strong. Protein-shock (p. 168) is occasionally used with success, and blood transfusion may be required (p. 158).

Nursing.—The patient should be kept warm in bed. Light but nourishing diet should be given, in which olive

oil may be advantageously included, say half-an-ounce daily. Only as much milk should be allowed as can be easily digested. General body massage is good, also plenty of fresh air and cheery surroundings. Unless everything is done to improve the general condition, bowel treatment will be futile. The mouth and finger-nails should receive daily attention. In bad cases the back will require great care. The nurse must see that a wet draw-sheet is not left under the patient, and must pad the bed-pan carefully.

Appendicostomy requires no further notice, except to remind the nurse that a catheter left in the wound should be clipped when irrigation is not proceeding; neglect of this precaution will bring its own lesson—a badly soiled bed.

Fig. 4.—The author's tampon tube for irrigation of the bowel in cæcostomy operations.

A cæcostomy will give more trouble. If a Paul's tube is to be used, the nurse should provide sterile tape for tying it in. The tube should not be removed until it has obviously worked loose and is of no further use—a matter of a week or less. Once the Paul's tube is removed, nursing troubles increase, as frequent dressings have to be applied to the wound. These should be absorbent and loosely applied, for the object of the operation is to allow the fæces to come out through the wound: a tight dressing acts like a stopper in the opening. The skin around the wound becomes excoriated and sore if not protected from the start. Ambrine, paraffin No. 7,

or zinc-oxide-and-resin ointment are about the best protectives; in the tropics the wax preparations may have to be made with a wax of slightly higher melting-point. As soon as the patient can bear it, a cæcostomy

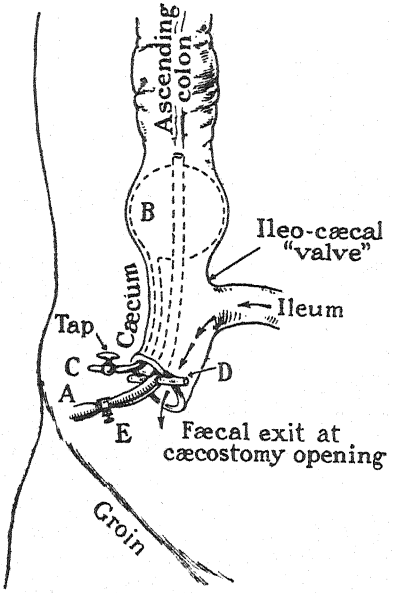


Fig. 5.—Diagram showing author's tampon tube in use after cæcostomy.

belt is applied, and worn until the wound is closed either naturally or by the surgeon—a matter of months. Occasionally the cæcostomy will have to remain permanently open. The bag should receive careful cleansing as often as required.

Bowel irrigation is done through a tube passed into

the cæcum, the patient being placed on a bed-pan. Often this method is not satisfactory, the fluid regurgitating instead of flowing through the colon. Irrigation will then have to be done through a tube in the rectum, catching the flow from the wound in successive kidney trays. This is a most messy method, and the nurse should have large mackintoshes well arranged to protect the bed and herself. The author's tampon tube (Figs. 4, 5) facilitates irrigation through the wound.

The tube is passed into the cæcum, with the bulb deflated, until well beyond the wound, then the bulb is blown up by means of a Record syringe. The amount of air required to blow it up to a size little more than that of a golf ball (say 2 ins. in diameter) should have been previously measured. Irrigation can then be carried out in comfort through the main tube without fear of reflux.

A cæcostomy, while trying and repulsive to all concerned, sometimes gives the most brilliant results in cases apparently hopeless.

ELEPHANTIASIS

Elephantiasis is the name given to any condition in which any part of the body undergoes chronic enlargement due to thickening of the skin and superficial tissues. The limbs, scrotum and breasts are the parts more commonly affected.

The predisposing cause is blockage of the lymphatic vessels with consequent damming back of the lymph in the affected part and secondary infection. As there are many things which can cause obstruction of the lymphatics, so there are many types of elephantiasis. Thus there are:

1. Cancerous elephantiasis.
2. Congenital ,,

3. Erysipelatous elephantiasis
4. Surgical ,,
5. Syphilitic ,,
6. Tuberculous ,,

All these are rare, but can occur in the home countries and therefore are grouped under the comprehensive term, *Elephantiasis nostras*, as distinct from *Elephantiasis tropicum*, which signifies filarial elephantiasis or *Elephantiasis arabum*.

For the present, filarial elephantiasis only will be considered. This, being the only form common in the tropics, is frequently designated simply "elephantiasis," as if there were no other kind; but this is a loose way of referring to the disease and somewhat misleading.

Filarial Elephantiasis

This disease is the indirect result of infection with *Filaria bancrofti* (cf. p. 62), but fortunately occurs in few only of those who have been infected by this worm. In other words, there appears to be some other factor, probably secondary streptococcal infection, which accounts for the appearance of elephantiasis in one infected person and not in another. However, the nurse need but remember that, in some manner, alive or dead, a *Filaria bancrofti* or its embryos, the microfilariæ, can indirectly lead to obstruction of the lymphatic drainage from any part of the body, and so cause elephantiasis in that part.

Clinical condition.—The part affected becomes swollen and œdematous, and there follows a gradual thickening of the skin, which becomes rugged and thrown into coarse ridges separated by deep grooves.

Recurring attacks of inflammation cause the part from time to time to become very red, swollen, hot and painful. These are attacks of lymphangitis and

are accompanied by sharp fever, known as "elephantoid" fever. With each attack the swelling waxes and wanes, but a little increase is left each time, so that in course of years an enormous increase results. The deep tissues, i.e., the bones and muscles, are only secondarily affected;

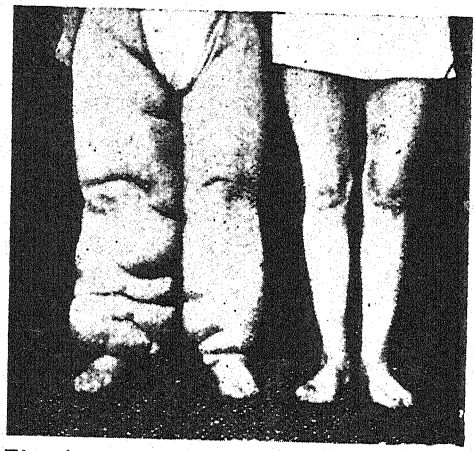


Fig. 6.—Elephantiasis in a woman of 31, contrasted with a normal woman of same age and build.

By courtesy of The British Journal of Surgery.

the real enlargement is superficial to the deep fascia. Between this and the skin there may be several inches of tough fibrous strands forming a meshwork with interstices filled with jelly-like pulp and clear fluid. The lymphatics and blood-vessels are greatly enlarged, and owing to the tension the skin is unhealthy and may be ulcerated.

Prognosis.—The disease lasts throughout life but,

apart from the fever and risk of septicæmia, the condition is not harmful; natives take but little notice of astounding enlargements. To a white person the unsightliness causes deep distress.

Treatment.—Medicinally nothing cures the dis-

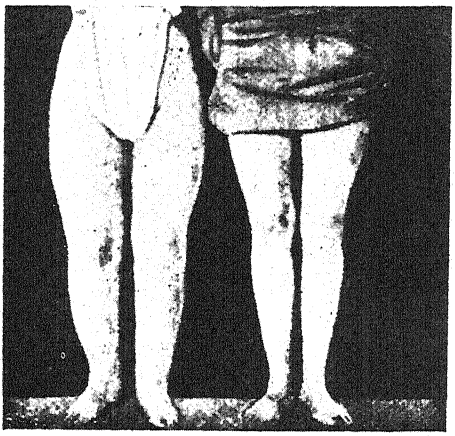


Fig. 7.—Same women—after treatment.
By courtesy of The British Journal of Surgery.

ease, but simple drugs like aspirin are useful during a bout of fever, and various tonics may be given. Vaccines or sera are sometimes of great benefit. During an attack of lymphangitis the patient should be in bed, the part elevated and fomentations applied until the inflammation subsides. While the temperature is raised a low diet should be given and attention paid to the bowels. Sulphonamides allay the inflammatory attacks.

Posture.—As fluid will always gravitate to the lowest part, it is obvious that to ease the tension and improve the condition of an affected part it should be raised above the rest of the body. Thus, if a leg be affected, the foot of the bed should be raised on blocks and the sufferer, for the rest of his life, should keep the bed thus, so that the ill effects of the upright posture in the day-time may be counterbalanced at night.

Constriction.—Elastic or "Occulta" stockings or firm bandages are excellent to retard the progress of the disease, but to be of use must be applied each morning before the part is lowered. In this way the benefit of the postural treatment during the night is maintained.

Massage.—When there is no inflammation, massage is beneficial, and should be both deep and vigorous.

By these methods the nutrition of the affected skin is improved and the frequency of the inflammatory attacks lessened.

SURGICAL MEASURES. 1. *Removal of septic foci.*—Ulcers or open sores obviously call for attention, but, in addition, search should be made for any other source of septic organisms, such as pyorrhœa or chronic infection of the tonsils, as organisms absorbed into the blood from such sources may well settle in the part of the body already attacked and give rise to further attacks of lymphangitis. The nurse should report to the doctor if her patient has cloudy urine or a vaginal discharge.

2. *Amputation.*—This is the method of choice for elephantiasis of certain parts, e.g. scrotum or breast, but for a limb should be used as a last resort.

3. *Kondoleon's operation.*—This operation is used for limbs. Long incisions are made in the skin, and the more redundant portions removed. Wide strips are also removed from the deep fascia. When as much as possible of this has been removed, the skin wounds are

sutured and dressing applied. I prefer a modification of this operation which has given satisfactory results.

SURGICAL NURSING.—*Preparation of the part.*—For some days or weeks before operation the skin must be maintained in the healthiest possible condition by the methods already mentioned, and by daily washing followed by careful drying. Two days before the operation the skin should be shaved; two hours later swabbed with ether and spirit to remove any surface grease. This is followed by an application of 1-per-cent. picric acid in spirit or tincture of iodine, wet methods of preparation not being suitable. The part is then wrapped in sterile towels—which are removed in the theatre at the time of the operation—and the area painted once more, taking care that the solution gets into every groove and crack. Upon the attention given to the preparation will depend, in great measure, the success of the operation.

Theatre technique.—Reliable tourniquets must be in readiness. The operations are often very sanguinary, and an adequate supply of sterile sponges and dressings must be provided. All bandages should be sterilized. Large sponge-cloths are required frequently, wrung out of very hot saline, of which a plentiful supply should be prepared. Check should be kept of the number of swabs and sponges used. In every detail, asepsis must be perfect, otherwise bad inflammation and even gangrene may follow. No special instruments are usually required. An enormous number of artery forceps will probably be used but not many vessels have eventually to be ligated. Very large cutting needles save time, and for the large wounds a sufficient quantity of suture material must be ready; interrupted silkworm gut sutures are usually preferred. Tension sutures may be used, requiring buttons or small rubber tubing; if possible, the nurse should inquire beforehand about these.

After-treatment.—Keep the part well elevated and, if a limb, keep watch upon the extremities to see that the circulation is maintained. The nurse should inquire about changing the dressings as they soon become soaked through. If she is to change them, there must be the same careful asepsis as at the operation. The stitches may be left in rather longer than usual, as healing is slow and good union very desirable. The part must be kept well elevated until the surgeon gives permission to let it down, but some elevation should always be maintained.

Remarks.—Surgical measures, except some amputations, are not always curative, but do an immense amount of good which will last for a long time. All such measures must be preceded and succeeded by all the other methods of treatment, the results being thereby rendered better and more permanent.

FILARIASIS

There is a group of diseases caused by infection with small worms called filariæ (hair-like), some of which cause serious disability, others cause little or none, but a nurse requires to have some knowledge of their effects and of what can be done in the way of prevention and treatment. The filarial form of elephantiasis has already been considered.

Filaria loa Infection

This worm is about $1\frac{1}{2}$ ins. long and of the thickness of No. 2 catgut. It is found only in tropical Central and West Africa, notably in the Cameroons, where it is very common.

Infection is conveyed by mangrove flies, these being a species of biting fly rather smaller than the ordinary house-fly. They bite in the day-time and may introduce many worms into a person's body.

Clinical course.—In many instances the victim has no knowledge that he is infected, and may remain in blissful ignorance of the fact for years, or possibly for ever. In other cases sudden movement is felt under the skin, and a *Filaria loa* may be seen wriggling along. Not infrequently this occurs in the eyelid or in the eye itself, a worm passing across it under the conjunctiva. All this may alarm the patient, but does no physical injury.

Sometimes an infected person may rather suddenly develop a swelling on some part of the body, arising as a localized lump the size of half an orange or as a more diffuse œdema involving, perhaps, a whole forearm or leg. Such swellings are known as *Calabar swellings*. They give rise to a tense, uncomfortable feeling in the affected part; even to considerable pain. The swelling usually disappears in less than a week, leaving behind no trace or injury. Swellings occur without warning at irregular intervals for many years, and may recur at the same part of the body or at different sites. Although in some way connected with the presence of *Filaria loa*, the actual cause of the œdema is unknown. Beyond creating discomfort and temporary disability, the swellings are harmless.

Infection with *Filaria loa* causes a marked increase of eosinophil cells in the blood.

Life-history of the worm.—When an infected fly bites a person, some immature worms are introduced through the bite or skin around. These grow to maturity and wander about the body. The females in time give birth to innumerable embryos. These are tiny worms which live in the blood-vessels, wriggling their way along among the blood-cells. They can be seen under the microscope when a drop of blood from the patient, taken in the day-time, is examined. These embryos are called microfilariæ loa to distinguish them from the adult *Filariæ loa*. These microfilariæ cannot develop

further unless they are sucked into the stomach of another mangrove fly, as happens when one of these feeds on an infected person's blood. This fly is in turn infected, and so the cycle goes on—flies infect man and man infects flies.

There is one phenomenon connected with microfilariæ loa which the nurse must remember. During the night they collect in the big blood-vessels in the lungs, and cannot be found in blood near the surface of the body, so that it is useless to look for them in a drop of finger blood taken at night. During the day, however, they come to the surface of the body, and can be found quite easily in a drop of blood when examined under the microscope.

Diagnosis.—the diagnosis rests upon:

1. Knowledge that the patient has been in a filarial area.
2. Swellings with the characteristics of Calabar swellings accompanied by an eosinophilia.
3. Discovery of the microfilariæ in the day blood.
4. Discovery of the worms under the skin or in the eye.

Note.—1 and 2 are sufficient for a diagnosis, even in the absence of the absolute proof afforded by 3 or 4.

To take blood for examination the nurse should make a thick film (p. 156), and also a covered wet drop (p. 157), and these must be made in the daytime, preferably between noon and 2 p.m.

Treatment.—Nothing curative has been found for the disease, which may last for years or a life-time. Should a worm show up under the skin a rapid incision over it will permit its removal.

Fomentations, or even poultices, may be required to relieve a painful swelling, but painting it with tincture of iodine will usually suffice. Occasionally an abscess forms which requires evacuation.

Prophylaxis.—The infection is acquired only through the bites of infected flies. These bite most fiercely in the day-time, and such precautions as are possible must be taken to avoid their attentions.

Filaria bancrofti Infection

This worm is about three-and-a-half inches long and scarcely thicker than a hair. It has widespread distribution, but is particularly common in the South Sea Islands, India, the West Indies, Central Africa, and South America.

Infection is conveyed by various mosquitoes.

LIFE-HISTORY OF THE WORM.—Except that the transmitting agent is a mosquito and not a fly, the life history of *F. bancrofti* is similar to that of *F. loa*, and the microfilariæ are rather alike in appearance. The microfilariæ, however, come to the surface blood during the night and not in the day-time, except in the Pacific Islands, and so can only be found by examining blood-films made at night.

The adult worms, unlike the *F. loa*, do not continually wander about the body of their host, but settle down in one place, usually in the neighbourhood of a deep group of lymphatic glands.

Clinical course.—If symptoms develop at all, they may be of the most varied description, and usually arise from some obstruction or inflammation caused, directly or indirectly, by the adult worms or the microfilariæ. Thus, there may be abscess formation, joint infections, enlargement of lymphatic glands in the groin or elsewhere, hydrocele, chylocele, chyluria, filarial elephantiasis, etc.

In conditions of chylous ascites, chylocele and chyluria, obstruction has occurred in the lymphatic vessels which transmit the chyle from the small intestine, with the

result that the chyle becomes dammed back and bursts into the periteneum, scrotum or bladder. In the last-mentioned condition the patient will pass milky urine, which will have a reddish tinge if much blood is also present.

Filarial elephantiasis is sufficiently important to be described in a separate section (p. 54).

Diagnosis.—The diagnosis rests upon:

1. Knowledge that the patient has been in a filarial area.
2. Development of typical lesions.
3. Finding microfilariæ in the blood. It is not always possible to find them in every case, but for examination the nurse should take specimens of the blood between midnight and 2 a.m., making a thick film (p. 156) and a covered wet drop preparation (p. 157).

HEAT EXHAUSTION

Heat exhaustion is a form of fainting, or syncopal attack due to the failure of the body resources for getting cool in the presence of a hot, humid atmosphere, with the result that sudden nerve exhaustion comes on. The condition is seen most typically in firemen in the stokeholds of ships in tropical waters, such as the Red Sea or Persian Gulf.

Clinical conditions.—The person is suddenly overcome with faintness, breaks into a clammy sweat, and frequently complains of severe cramp in many muscles of the body and limbs, which may double him up or cause the limbs to stick out in grotesque attitudes. The body is cold to the touch.

Treatment.—A current of fresh air is directed on to the patient, and stimulants given in the form of smelling-salts, alcohol by mouth, or a hypodermic

injection of ether, min. xxx, camphor in oil, gr. i., or strychnine, min. viii.

The patient is put to bed between blankets, and a hot bottle placed at his feet. Briskly rub him over with a rough dry towel, giving good friction, or slap the skin sharply with the bare hands. Sponge the face and neck with whisky to which a little water has been added.

When the patient has made a good recovery administer 5 grains of calomel and follow this in three hours with a dose of salts.

Complete recovery is usual.

HEAT STROKE

Heat stroke is a condition of intense fever (hyperpyrexia) which occurs in certain low-lying tropical valleys and coastal towns. The disease frequently supervenes upon some other illness, such as typhoid, and occurs in people debilitated by illness or age, and in newcomers to the district. Heat stroke is prevalent at those seasons when the heat is worst, and is more likely if manual work has to be done in a stagnant or ill-ventilated atmosphere.

The onset is frequently at night, and may be quite unexpected, but there are usually some warning symptoms during the preceding twenty-four hours. Manifestly, any such premonitory symptoms are of the utmost importance, as their recognition and prompt treatment may ward off a dangerous attack.

Premonitory symptoms.—Frequency of micturition is one of the most constant symptoms, the urine being voided frequently but in small amounts. It may contain albumin or blood. A dry skin may be noticed, as the perspiration completely fails; in hot weather this should be both noticeable and alarming. Restlessness, or

drowsiness, with headache and dislike for glare, together with great thirst and loss of appetite, all suggest impending attack.

The attack.—The actual onset of the hyperpyrexia may begin with sudden restlessness, convulsions or delirium, while the temperature mounts rapidly to about 110° F. The pulse becomes rapid, the pupils contracted and the respirations shallow. Occasionally there is vomiting or watery diarrhœa.

The patient quickly becomes unconscious, then comatose, and death will soon follow if restorative measures are not promptly adopted.

Diagnosis.—Usually doubt exists only of the possibility of cerebral malaria. Blood examination and the absence of splenic enlargement will eventually settle this point; but meanwhile the treatment of the hyperpyrexia should include an injection of quinine (*see* p. 165).

Treatment.—Circumstances will greatly modify treatment.

1. Should a patient, already ill in bed, develop premonitory symptoms of heat stroke (and in great heat a nurse should be on the watch for such symptoms) the first thing is quietly to arrange for a fan or punkah to keep a continuous current of air directed on the patient, who should be stripped of all but a loin cloth. An ice-cap (p. 165) should then be applied, and a mackintosh or mat placed below the patient, and his whole body sponged, but not dried. A cool soap enema may then be given, and after this the patient should be sponged every quarter-of-an-hour, so that there is continuous evaporation from the body surface. Copious drinks of tepid water, tea, or coffee should be given, and if the patient seems weak and exhausted a little diluted brandy may be allowed. All this can be done as if for the original illness without causing alarm, but the doctor must be notified at the earliest possible moment.

The restoration of perspiration or the onset of natural sleep may be regarded as a good omen, but the patient must be kept as cool as possible and under close observation for some days.

2. Should premonitory symptoms be discovered in anyone during his daily work, it is perhaps wise to drop a hint that a heat stroke is impending, and persuade him to come indoors, when he should strip and either get into a cold bath or be sponged down. An enema is also advisable, and the patient should remain stripped and rest quietly in the coolest possible draught under observation.

3. Should an attack of hyperpyrexia develop, the nurse should rapidly arrange to give the patient a cold spray (*see* p. 160) and apply an ice-cap (p. 165). If plenty of assistance is available, a rectal injection of one or two pints of cold water may also be given.

Death, if it occurs, is usually caused by respiratory paralysis, so that any cessation of respiration must be met by slow (16 to the minute), regular, and prolonged artificial respiration, continued until natural breathing is restored or until it becomes clear that the heart also has failed.

A hypodermic injection of digitalin ($\frac{1}{100}$ gr.), or ether (20 min.) is beneficial and, as already suggested, an intramuscular injection of quinine (5 gr.) should be given at once. Strychnine is not recommended.

When the temperature has been reduced to 102° F., the cold applications may be stopped, but should be renewed upon the slightest sign of the temperature rapidly mounting again, for which close watch must be maintained.

When consciousness is restored the patient may be given copious *hot* drinks, such as tea or coffee, to stimulate perspiration, and after recovery large quantities of fluids must be consumed daily. As soon as possible

after an attack the doctor will probably order removal to some cooler district, but until then the patient should remain quietly indoors in a continuous current of air, kept up night and day by fan or punkah. Without such precautions recurrence is not improbable.

HELMINTHIC OR WORM DISEASES

The parasites causing helminthic or worm diseases can be divided into three groups—round-bodied worms, tapeworms, and flukes. In some cases it is the adult worms which cause trouble; sometimes it is the embryo or immature forms produced by the adult worms; in others the eggs; or again, it may be all three.

It should be understood, moreover, that no matter how many eggs or embryos the parent worms may produce inside a patient's body, they can never reach maturity until they escape from the patient. Thus, if a patient has, say, a hundred adult worms in his body, no matter of what species, a hundred adults they will remain until they die or are ejected, but they will never increase in numbers unless the patient becomes re-infected, although they may give rise to innumerable eggs or embryos. It is, of course, possible for a patient to re-infect himself, as notoriously happens with thread worms.

Manifestly, therefore, prevention of infection or re-infection is the most important part of the struggle against the various helminthic parasites.

Having already discussed some filarial worms, we shall now consider other round-bodied worms or Nematodes.

ASCARIS LUMBRICOIDES

Popularly known as the "round worm," this variety is very commonly found abroad, especially in the Far

East. The adult worm, both male and female, is not unlike a very large earthworm as seen in any garden.

The worms inhabit the small intestine, and one or many may be present. Their eggs are passed in the stools and, unless proper sanitary arrangements are in use, will soon pollute the ground, especially where the garden soil is enriched by human manure. Hence, raw vegetables, as used in salads, form a common source of infection.

The eggs can remain alive for months and, if during that time they are swallowed by animals or man, each egg hatches out and the young worm bores its way into the lungs; from there it works its way up the trachea into the pharynx, whence it is swallowed down the œsophagus, and passes through the stomach to the intestine where it soon matures into an adult. The sexes then pair up, and the female worms start to lay innumerable eggs, which are, in turn, passed out in the stool to await their chance of being swallowed afresh. Infection, then, occurs through taking in with food eggs which have been passed in the stool of some infected person or animal.

Symptoms vary greatly in severity; they may be entirely absent or, on the other hand, may be fatal.

Manifestations of toxæmia include urticaria or pyrexia, though these are not common. The most common symptoms are those of vague digestive troubles with decreased, increased or perverse appetite. In large numbers the worms may cause acute intestinal obstruction or, by crawling into the bile-ducts or appendix, give rise to jaundice, liver abscess or appendicitis. They may even penetrate the gut-wall and cause peritonitis. As the infection is very common, it is fortunate that severe symptoms or complications are rare. Occasionally a worm will make its way up the œsophagus and appear out of the mouth or nose, or may be vomited. It is not

uncommon to find worms in the stool, especially after purgation.

Diagnosis is made fortuitously by finding a worm in the stools, or, more deliberately, by a microscopic examination of the stools, when the eggs can readily be detected.

Treatment consists in giving some drug which will kill or cause the removal of the worms. Such drugs are known as vermifuges, and they are mostly dangerous because of the poisonous nature of the drug, or because of the size of the dose which it may be necessary to use, or on account of the age or infirmity of the patient. When dealing with a vermifuge drug, it behoves the nurse to know clearly what she is giving, how much is to be given, when and how it is to be given, and what, if any, purgative is to follow, and at what interval. Should any of these points be indefinite, it is the nurse's duty to inquire about anything vague or unusual.

As a safe working-rule, no vermifuge should be followed by oils, fat or alcohol. These may be given unthinkingly as castor oil, milk or brandy. Without special instructions to the contrary the nurse should avoid these. The above remarks apply to the treatment of other helminthic infections besides ascaris.

For ascaris the following drugs are commonly used:

Santonin.—A yellowish-white crystalline powder, given in doses of 5 grains to adults, less to children. It is preceded by a period of purgation and starvation, and followed about two hours later by a dose of castor oil which, with santonin, can be used safely.

Oil of chenopodium.—A pale-yellow oil with a very penetrating odour. The dose for adults is 25 min., usually divided into two or three doses and given at hourly intervals, either in an emulsion or in capsules. Preliminary starvation is required as for santonin, and sodium sulphate should follow, not oil.

Carbon tetrachloride.—A colourless liquid with a heavy smell, rather like chloroform. The dose for an adult is one drachm, or 3 c.c. This dose is usually divided and given at short intervals. The drug can be given neat or in capsules. It is followed by salts, and has the advantage that no preliminary purgation or starvation is required. A little glucose or sugar should be given about an hour before the carbon tetrachloride, to prevent its affecting the liver.

Hexylresorcinol.—This is given on an empty stomach in capsules or pill form, the dose being 0·1 gramme *t.i.d.* for each year of age up to a total of 1 gramme three times in one day; it is followed by a dose of salts.

After treatment all stools should be saved for examination for several days.

Prophylaxis.—The nurse must see that all stools from infected patients are burned or properly disinfected and removed. If it is clearly understood that uncooked vegetables and impure water are the chief sources of infection, the nurse will be able to do much towards protecting herself and others from acquiring worms.

Ancylostomiasis or Hookworm Disease

This disease, which is a curse of many parts of the tropics, particularly the Far East, is caused by two small closely allied worms—*Ancylostoma duodenale* and *Necator americanus.*

Both worms are greyish, about half-an-inch in length, and look rather like bristles from a nail-brush. This resemblance is of some practical importance and will be discussed later. The worms are popularly known as hookworms. They inhabit the upper part of the intestine, where they attach themselves by their mouths to the gut-wall and feed on the blood of their host.

Hundreds may be present at a time, and the eggs which are passed in the stools can be detected with the microscope.

LIFE-HISTORY.—If the stools are scattered in the fields, the embryos, which soon hatch out from the eggs, bury themselves in the mud or crawl on to grass stems, etc. There they lie in wait till a bare foot or hand touches them, when they bestir themselves and quickly penetrate the skin, causing an irritation known as "ground itch." Once through the skin, they travel *via* the bloodstream to the heart, thence to the lungs (where they cause an irritating cough or bronchitis), then up the trachea and down the œsophagus to the intestines, where they soon reach maturity and lay eggs and produce symptoms in their new host.

Symptoms.—The symptoms manifested during the invasion are, first, the "ground itch," which may, or may not be noticed; and next, some cough or lung trouble which again may not be remarked. The remaining symptoms are simply the outcome of the loss of blood along with some sepsis or toxæmia, acquired through the numerous tiny bites made by the worms in the intestinal mucosa. These symptoms are loss of energy and power of concentration, headaches, œdema and anæmia, which may be very severe indeed. Abortion is frequently caused, and failure of lactation.

Treatment.—Hexylresorcinol, carbon tetrachloride or oil of chenopodium can be used as for round worms (p. 69), or, after a preliminary purgation with salts, thymol can be given in doses of 30 gr., repeated twice at hourly intervals, and later followed by salts. Note that while the maximum official B.P. dose of thymol is 3 gr. only, three doses are here suggested, each of 30 gr., making a total of 90 gr. administered in three hours. Safety, however, lies in the fact that the thymol has not time to be absorbed into the system. The

nurse must take care, however, to see that no fats, alcohol or oils are given, as these would render the thymol much more readily absorbed, and poisoning might follow.

After treatment all motions must be saved for examination. The examination is made by washing the stools through a fine sieve, when the "bag" of worms left behind can be seen. If the utensil or sieve has previously been cleansed by a nail-brush some of the bristles may have been enmeshed, and will be caught and mistaken for worms when the stool is washed through. On this account a nail-brush must be avoided.

Prophylaxis.—From the life-history the nurse will grasp that infection occurs through the skin, and that in districts where hookworm infection is prevalent, all soil, damp walls, grass or any low scrub is potentially a source of infection, and the bare skin should not be allowed in contact therewith. Nor must infected water be drunk. Stools from infected patients must be disinfected or properly destroyed.

Guinea-Worm

This parasite is common in localized areas in Africa, India and Brazil.

LIFE-HISTORY.—The adult parasites, of which only the female can usually be found, inhabit the human body. The female, white in colour, is from one to three feet in length, and about the thickness of a bodkin. She makes her way towards the surface of the body, usually near the ankles, where she lies entwined amidst the tendons, fasciæ and vessels.

Later she bores a tiny hole in the skin, causing a small blister which soon bursts. Through this opening she

discharges her young from time to time whenever the part comes in contact with cold water, until all the embryos have been discharged. These little worms swim about in the water and attack a form of tiny crustacean, if there are any present. The embryos enter the body of the *Cyclops*, as these crustaceans are called, and are there able to grow. If a person drinks some of the water containing the infected *Cyclops* the young worms will be set free, unharmed, by the digestive juices of the stomach; thence they make their way through the body and grow into adult worms, the females in due course giving birth to a new generation.

Symptoms.—There may be a little fever or urticaria from time to time, and the blood shows an eosinophilia. Later there is itching at the site of the puncture made by the worm in the skin. Should the worm die, or be broken by injudicious tugging, an abscess is likely to form, and the resulting inflammation and destruction of tissue may be very serious.

Treatment.—If once a guinea-worm is seen or suspected beneath the skin, it should be encouraged to puncture the skin and give birth to its young, for until this process is complete any interference with it is fraught with danger, and must certainly never be undertaken by a nurse upon her own responsibility. Bathe the part from time to time with cold water, and in the intervals apply fomentations of plain cold water. In this way the worm will be encouraged to perform, and the nurse may watch the milky fluid containing the embryos being poured forth.

Needless to say, the water into which such fluid is shed must afterwards be sterilized by antiseptics or by heating.

After a few days, when a stream of cold water from a sponge held over the part no longer provokes a gush of fluid, the head of the worm, which is often protruded,

may be very gently pulled upon and retraction prevented by catching it in the cleft of a split match and twisting it up as far as the patient's skin. Only the slightest traction should be employed, and this will prove sufficient once the worm is loose.

Prophylaxis.—No infected people should be allowed near any source of water supply, and all drinking-water should be carefully filtered or boiled.

TAPEWORMS

There are three kinds of tapeworm which affect man in much the same manner, and are found in Europe as well as in the tropics; they are *Tœnia saginata*, *Tœnia solium* and *Bothriocephalus latus*. These three can be considered together, but a fourth variety, *Tœnia echinococcus*, must be described separately, as it is very different.

T. SAGINATA, *T. SOLIUM*, and *B. LATUS*

LIFE-HISTORY.—Usually only one worm is present in a patient, but there may be more. They live in the small intestine, feeding on the food eaten by their host, and may grow to 2 ft. in length. In appearance each resembles a piece of white tape marked into segments, which are very small at the head end and grow gradually larger towards the tail, where "ripe" segments form, each about an inch long. As the worm grows, these ripe segments, which are full of eggs, break off and are passed out in the patient's stool. As symptoms are slight or absent, the first intimation that a person is infected usually comes from the discovery of one or more of these segments crawling about a freshly-passed stool; in an old stool they lose their mobility.

In the absence of proper sanitation, the stools and

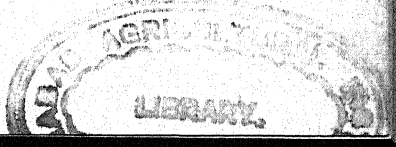
eggs may be deposited on the grass, or in a stream, and the young embryos which hatch out may then be eaten by cows (*T. saginata*), pigs (*T. solium*), or fish (*B. latus*). In these animals the young worms make their way to the fleshy parts, become encysted and remain there until the animal is killed. Such flesh should be detected by inspection and discarded as "measley meat." If, however, this is not done, and the flesh is improperly cooked and eaten by man, the cysts are digested and the young worm, or worms, start their life afresh as adults in their new host's intestine.

Treatment.—After adequate starvation, a purgative is given, followed by a vermifuge drug. Male fern (*Filix mas*) is most commonly used, given in doses of one or two drachms, but many other drugs are in use for this disease. A saline aperient follows in two hours, and the greater part of the worm always comes away at once, but all the stools should be carefully searched for the worm's head; the finding of this is the only guarantee that the worm will not grow again. The cure of tapeworm is not always easy, and the treatment may have to be repeated more than once.

Tænia echinococcus and *Hydatid Cyst*

The little tapeworm, *Tœnia echinococcus*, is only about an inch long. It is a parasite of dogs and rats, and reaches man only, as it were, by accident; but when this happens it is much the most serious of all the tapeworm infections. It is found chiefly where there is a close association between dogs and man, as on the ranches in Australia, in which country it is comparatively common.

With this parasite man becomes infected by swallowing the eggs which have been passed by a dog, and which have by some means contaminated his food—usually *via* the man's hands. From the intestine the young



embryo makes its way to some other part of the body, usually the liver, where it becomes encysted and grows to form the well-known *hydatid cyst*. One of the following results must ensue:

1. The worm dies and the cyst dries up, so that a spontaneous cure follows.
2. The worm dies and an abscess follows, which may cause grave illness or death. Operation is the only hope of cure.
3. The worm lives and the cyst grows bigger and bigger until it causes serious pressure symptoms, or ruptures, with disastrous results.

Diagnosis may be extremely difficult and, from the position of the cyst, treatment may be unavailing; but, from familiarity with the disease, surgeons in Australia are very skilled in dealing with these cases. An intra-dermal reaction can be a great help in diagnosis. Treatment is by aspiration or open operation. Medicinal treatment has no curative value.

LEISHMANIASIS

The name leishmaniasis is given to a group of diseases having as their causes similar organisms and, incidentally, having for their cure similar methods of treatment.

These diseases are:

Kala-azar, caused by *Leishmania donovani.*
Oriental sore ,, ,, *Leishmania tropica.*
Espundia ,, ,, *Leishmania americana.*

Oriental or Tropical sore

In many parts of the tropics a form of skin ulceration occurs, due to the presence of a parasite—*Leishmania tropica*. This organism is conveyed by sandflies, and the ulcers, therefore, occur on the exposed parts of the body.

One or several ulcers may arise about the same time, but these give immunity or protection from further infection.

The sores begin as small itchy pimples which gradually enlarge and break into ulcers, slowly attaining the size of a penny. The ulcers are a little raised at the edges, the surface being unhealthy, with chronic inflammation around. They are not particularly painful, but may be very tender to the touch. Without treatment, the ulcers persist for weeks or months, but eventually heal, leaving a soft scar.

Diagnosis.—The diagnosis is made by making smears from the edge of the ulcer which, on microscopical examination, will be found to contain parasites.

Treatment.—The disease is treated by local application of an antimony ointment and simultaneous intravenous injection of some antimony salt. Another method of treatment is with X-rays and a simple soothing ointment, or sterile dressing. Applications of carbon-dioxide snow are also used, or the ulcers may be excised.

Prophylaxis.—Fine netting and the use of oils objectionable to insects are the only protections available. The sandflies breed in cracks in walls or banks, and any structural defects of this nature should be put right.

Espundia

A form of skin ulceration similar to Oriental sore is found in South America, caused by *Leishmania americana*, but is a more serious disease in that not only is a skin ulcer formed but months later the mouth and nose are attacked.

If the patient is not treated, severe ulceration occurs on the palate, eating its way alike into mucous membrane and bone, and causing grave illness which, after great suffering, ends in death from septic absorption or pneumonia.

Fortunately, intravenous injections of antimony tartrate rapidly cure the patient if the disease has not already advanced too far.

Kala-azar

Kala-azar is a disease very prevalent in many parts of India, but is rare in Africa save in the Sudan.

Cause.—The cause is a small parasite, *Leishmania donovani*, found especially in the spleen and bone marrow, and conveyed from one person to another, probably by the bite of the sandfly.

Clinical manifestations.—The disease has a very chronic course, and if not treated may last one or two years, beginning in a vague manner with a low, irregular fever, occasionally with rigors and high fever. These bouts of fever may last several weeks, alternating with periods of apyrexia.

The spleen early becomes enlarged, later the liver also; after the disease has progressed for some time the spleen may be huge, almost filling the abdomen, which appears all the more prominent because the patient has by this time become emaciated.

Ascites is common, also œdema of the lower limbs. Hæmorrhages from the nose, gums or kidney may occur. Anæmia is marked, and especially is there a great fall in the number of white cells; this disease being one of the few fevers with a marked leucopenia.

Gradually the patient, if untreated, becomes more and more cachectic, and develops that dusky colour which gives the disease its name—kala-azar, meaning black fever. Death is frequently hastened by the development of some complication in an exhausted patient.

Diagnosis.—The large spleen and leucopenia suggest kala-azar, as does the failure of quinine to cure; yet,

in spite of this, the disease is often mistaken for malaria. Usually, however, the diagnosis is confirmed by the *formol-gel* test, or by puncturing the spleen or liver and finding the parasite in the juice extracted.

For punctures the nurse should note the following points:

Have ready a dozen clean slides.

The needle and syringe must be sterilized dry, or boiled, and then dipped in spirit and dried over a flame, as any moisture in the syringe will render recognition of the parasite difficult or impossible.

Place a binder under the patient before the puncture is performed, and immediately it has been done fasten the binder firmly around the upper abdomen, and make the patient lie quiet for a time. The risk of fatal hæmorrhage from the spleen is thus minimized.

Any signs of internal hæmorrhage, such as abdominal pain or a rising pulse-rate, must be reported at once.

Treatment.—During a bout of fever the patient should be kept in bed and given light but nourishing diet. His resistance to any secondary infection is very poor, therefore the greatest care must be taken to keep the mouth clean; cancrum oris or septic pneumonia are not uncommon.

Visitors or attendants with colds should not be allowed in the patient's room, and influenzal infection is particularly dangerous. Moreover, even minor operations, e.g. passing a catheter, must be rigidly aseptic, being attended with more than the usual risks.

Bedsores are especially to be dreaded. Cold sponging is refreshing when the pyrexia is marked.

Quinine is useless. Many antimony preparations have been used. Originally, antimony tartrate was given,

then more complex compounds like stibosan and stibamine. Recently, treatment with diamidinostilbene has been successful. This is given either intramuscularly or, more usually, intravenously, two or three times weekly in doses of 1 to 2 mgm. per kilo. of body weight.

LEPROSY

Leprosy is a disease with an indefinite onset and a chronic course lasting, in most cases, for years. It is caused by a definite germ which affects the whole system. The disease shows itself clinically as skin nodules and rashes, nerve destruction, with tingling and loss of sensation in the parts affected, and severe ulceration.

Distribution.—At one time widespread, the disease has gradually receded before civilization and cleanliness, and is now chiefly confined to the tropics, occurring especially in crowded areas.

Cause.—The cause is a bacillus closely resembling the tubercle bacillus and known as the *Bacillus leprœ.*

Infection.—Leprosy appears to be acquired through prolonged and intimate contact with a person suffering from the disease. The exact manner in which the germ is introduced into the system is not known; possibly it is through the nasal mucous membrane.

Pathology.—First there is invasion by the bacillus of the various tissues of the body; then, as the result of Nature's ineffectual attempts at cure, a growth of fibrous barriers and cells around the bacilli; finally, the havoc occasioned by the repair as well as by the invasion and destruction, causes terrible deformities.

Clinical course.—The disease attacks both sexes, usually between the ages of ten and forty years, beginning very insidiously with small discoloured anæsthetic patches on the skin, especially the forehead, and altera-

tion of sensation in some part of the body. There may be irregular bouts of fever. As the disease progresses it may assume the nodular type, the nerve type or the mixed type.

In the *nodular* type the skin lesions become raised, giving the features a rugged expression, and nodules of varying sizes may form on the body or limbs. These may later ulcerate and form dreadful weeping sores. The eyes are frequently attacked, leading to blindness. Ulceration and destruction of the nasal septum may occur, causing disgusting disfigurement and frightful fœtor. Eventually, perhaps years from the commencement, the patient becomes weakened and dies, often from some other disease.

In the *nerve* type various nerves supplying muscles and skin areas are affected, resulting in muscle weakness and atrophy, and loss of sensation in the skin, which, at the places affected, becomes atrophied and discoloured. As a result of the anæsthesia, perforating ulcers may occur on the foot; while, on the hand, septic sores or burns, which are not felt, may lead to a loss of fingers.

In time, in the nerve type of the disease, the infecting bacilli may die out, but the nerve destruction, and the ravages resulting therefrom, remain.

The *mixed* type is simply a combination of the other two.

Treatment.—Treatment in most places is now carried out in special hospitals or camps where the lepers are isolated. The cure of any patient cannot be regarded as certain; but by judicious treatment the progress of the disease can be greatly delayed, or even arrested for years. The drugs used and the routine adopted in different parts of the world vary so greatly that no attempt will be made here to give details. In such places as the nurse has to carry out treatment, the special technique employed there will be explained

to her. Most methods involve injections, intravenous (p. 166), intramuscular (p. 165), or intradermal.

Chaulmoogra oil, or one of its derivatives, is very commonly used in the treatment, and potassium iodide is used in large doses.

Prophylaxis.—Complete isolation of all lepers from the rest of the community is the ideal towards which the medical authorities strive, as it is the only certain method of controlling the disease.

In leper camps and institutions the keynote for the attendants is cleanliness with the endeavour to keep themselves as fit as possible by fresh air and judicious eating and drinking. The attendants' food and water supply should not be handled or approached by lepers.

The nurse must remember that discharges from sores and blood from the nose or from bleeding nodules contain the bacilli; therefore all dressings should be burnt. Gloves may be worn when handling the patients, but the nurse can feel reassured that, contrary to popular opinion, leprosy is not a disease very readily acquired. Most big hospitals, from time to time, take in a patient with leprosy, who is placed in a general ward without any very special precautions being taken, beyond keeping his effects and utensils separate. No case of infection has been known to follow, for in order to acquire infection intimate contact with a leper's body, discharges or clothes is necessary.

The conception of leprosy as an easily communicable disease, which has been fostered by trashy novels and notably by "the pictures," is both mischievous and misleading.

MALARIA

Malaria is the most common fever of the tropics and sub-tropics, and is caused by parasites introduced into

the system by the bites of mosquitoes. It is characterized by a series of clinical phenomena accruing from the effects of the parasites. The disease is responsible annually for a high mortality.

THE PARASITES.—Three distinct parasites cause respectively three types of the disease, but two types frequently co-exist in the same patient.

Infection with *Plasmodium vivax* causes benign tertian malaria.
" " *Plasmodium malariæ* causes quartan malaria.
" " *Plasmodium falciparum* causes subtertian malaria.

A fourth parasite, *Plasmodium ovale*, is rather similar to *P. vivax*, and causes a similar tertian type of fever, but usually milder.

Benign Tertian Malaria

LIFE-HISTORY OF *Plasmodium vivax* and *ovale*.—Following the bite of an infected mosquito, some parasites enter the patient's blood and each penetrates a red blood-cell. In each, growth occurs and the parasite enlarges, as does the containing red cell. After forty-eight hours growth ceases and the parasites each divide into some twelve to twenty-four minute bodies, which are, indeed, young parasites clustered in the red cells.

These cells now burst open, permitting the young parasites to escape into the blood-stream, or plasma, where each little parasite attacks and invades a fresh red cell and begins to grow; thus the whole process begins again. This cycle is completed every forty-eight hours, increasing numbers of red cells being attacked each time, until a stage is reached when the destruction of red corpuscles amounts to several millions every twenty-four hours.

A few of the parasites, however, do not divide, but remain in their red cells as single large growths, constituting the male and female forms. For further development these must await an opportunity to issue from the patient's blood. Such an opportunity arrives when a female anopheline mosquito bites the patient and sucks into its stomach blood containing the malaria parasites. When that happens the male and female parasites unite in the mosquito's stomach, burrow into the wall, forming little cysts, and in due course produce thousands of young.

The young parasites wander to the mouth of the mosquito which is now infective; henceforth, with every bite of the mosquito some of these young parasites escape into the punctured skin of the new victim. The invaders at once attack the red cells of their new host and go through a similar life-history, causing another case of malaria.

In this manner, and this only, does Nature transmit malaria from person to person; all the old notions about swamps, damp air and what not being merely so much nonsense, except in so far as these conditions, by providing ideal mosquito nurseries, favour mosquito breeding. Could we but promise a person complete protection from all mosquito bites, we could guarantee complete freedom from malaria.

It behoves a nurse, therefore, to have some knowledge of the anopheline mosquitoes and their habits, that she may avoid their unwelcome attentions and assist in their destruction. For this reason some space has been devoted to the subject later in the chapter.

Effect on the Patient

Some days or weeks after a person has been bitten by an infected mosquito, he begins to feel "off colour"—

nothing definite—perhaps a headache or chilly, languid feeling. There follows an irregular fever which soon settles into an orderly sequence of elevations in temperature, and the patient develops typical malarial attacks, which, for descriptive purposes, fall naturally into three stages:

1. The cold stage, rigor, or ague.
2. The hot stage.
3. The sweating stage.

The cold stage.—The patient suddenly feels and looks cold; the face is drawn and pinched; the teeth chatter, and violent shivering shakes the whole body. In spite of this, the temperature is now above normal and is steadily rising. A severe headache is present and there may be vomiting. The pulse is rapid, small and wiry, and the patient feels very ill. The urine is pale and a considerable quantity may be voided. This stage lasts for an hour or more before merging into the second or hot stage.

The hot stage.—A succession of warm flushes are felt and soon shivering ceases, being followed by a glow of warmth rapidly amounting to an intolerable heat. At this stage the patient's temperature will have reached its maximum, usually between 104° and 106° F. His appearance becomes greatly changed, the face being flushed and the veins dilated; there is severe headache, excessive thirst, restlessness and intolerance of the bedclothes.

The pulse remains rapid, but becomes full, soft and bounding—a typical febrile pulse. The tongue is large, flabby and furred. The urine is scanty and dark coloured, but does not contain bile, and is not likely to show more than a trace of albumin.

The hot stage lasts two or more hours, until with relief the patient begins to perspire.

The sweating stage.—It is hardly necessary to

describe the perspiration which follows. Those who have seen it do not require a description, others could scarcely credit it. Suffice it to say that the sweat pours from the patient. The sweating may continue for three to four hours, but every moment brings to the sufferer greater and greater relief. As the sweating diminishes the temperature drops rapidly to below normal, leaving a tired, weak, "washed-out" patient.

Further elevation of temperature will not occur for forty-eight hours from the start of the attack; then a fresh bout of fever will commence and the succession of events will be repeated.

In this manner benign tertian malaria affects an adult and, in the absence of treatment, attacks will recur on alternate days, perhaps for weeks, until the patient is a mere wreck of his former self.

Eventually the attacks lessen in severity, then cease; only to return at some future date.

The complete course.—Having now studied the growth of the parasites and the patient's symptoms, let us correlate these and form a clear mental picture of the disease.

First, an infected mosquito bites a person and thereby introduces a few benign tertian parasites, too few, however, to cause illness; then ensues a period of incubation, lasting about ten days. During this time the parasites multiply until so many red corpuscles are damaged that the patient begins to feel poorly, and may show an irregular temperature.

Finally, the rigors commence, and we can now understand their origin: each fully-grown parasite, by bursting open its red cell, liberates all the poisonous products of growth which have collected in the corpuscle.

In small quantities such toxins have no apparent effect; when, however, millions of bursting cells simultaneously pour their noxious products into the blood-

stream, the total quantity of poison becomes considerable, and causes the onset of a febrile attack.

Since forty-eight hours are required for the liberated parasites to grow to the bursting-point, a benign tertian malarial rigor must occur every other day: nowhere else in the whole range of medicine can be found such a regularity in temperature elevation. (Fig. 8, p. 101.)

The temperature chart is diagnostic and, counting inclusively, the fever occurs every third day, and is therefore called tertian. This type of malaria, being rarely fatal, is termed benign: hence the name—*benign tertian malaria.*

Some additional symptoms and signs remain for consideration.

Manifestly, the red cells are rapidly reduced in number, making *anæmia* a prominent feature.

From her knowledge of physiology, the nurse will know that one function of the spleen is to filter from the circulating blood any dead or dying red corpuscles or other débris; hence in malaria two things happen to the spleen: (1) in order to cope with the multitude of destroyed red cells *the spleen becomes enlarged* and may be tender; (2) because it filters out the dark débris, or pigment, from the parasites, the spleen itself assumes a dark slate colour.

The chief clinical features of benign tertian malaria may therefore be stated as follows:

1. The orderly sequence of the three stages.
2. The unique temperature chart.
3. The anæmia.
4. The enlarged and tender spleen.

Prognosis and Treatment

Prognosis.—Benign tertian malaria is seldom fatal except in those weakened by ill-health, or in infants and young children. If an infected person goes to some

country where re-infection is impossible, the malarial parasites vanish in three or four years, and true malarial attacks then cease. In the tropics, however, constant re-infection may occur, causing malarial attacks to persist.

With treatment the fever can be controlled, future attacks aborted, and the patient's general health maintained; but complete freedom from further attacks cannot be guaranteed until the patient has resided for three to four years in a non-malarious country.

Treatment.—Mild attacks of malaria are so common that the white resident in the tropics treats them with contempt and, feeling an attack imminent, takes a big dose of quinine, hoping to avert the attack—a bad procedure, as will be understood from the study of blackwater fever (*see* pp. 19 and 108).

The course of treatment about to be described is for a moderately severe attack in an adult; this may, of course, be modified in accordance with the doctor's instructions.

During the cold stage.—Put the patient to bed between blankets and arrange netting to keep off mosquitoes. Warm the bed with hot-water bottles; failing the proper article, soda-water bottles can be substituted, but the corks must be securely fastened. Ten grains of quinine is usually prescribed, followed by a hot drink, preferably lemonade. Record the temperature, pulse, and respiration every four hours and, if feasible, record the temperature every half-hour, thus marking on the chart a perfect record of the attack.

During the hot stage.—Carefully watch the patient lest he become delirious and perhaps sustain some injury.

For the intense thirst give plenty of barley-water or lemonade, cold but not iced. Cold cloths to the forehead or behind the ears afford some relief from the headache or, when this is very severe, an ice-cap is better (p. 165).

It is not usual, and indeed is inadvisable unless the room temperature is excessive, to sponge the patient. This practice certainly reduces the temperature; but since a fall is about to occur naturally, cold sponging may induce collapse. A current of air from a fan or punkah is soothing and refreshing.

During the sweating stage.—Native mats may be used to protect the bed mattress from the damp blankets. Roll the patient in blankets, and do not disturb him until the perspiration is stopping.

Keep watch on the pulse and colour lest collapse occur. When the perspiration has almost ceased, dry the patient with a warm towel and change his clothing and bedding, leaving him warm and comfortable. Give a cup of bovril, hot milk or weak tea, after which he will probably fall asleep to awake much refreshed.

Quinine may now be started systematically with 30 gr. daily. A brisk saline purge on the morning following the attack is advisable, e.g. a tablespoonful of sodium sulphate, the effect of this being enhanced by a cup of hot tea or coffee given an hour afterwards.

The patient should remain in bed and be given a light nourishing diet. There may be one more rigor, but with proper treatment there is no likelihood of more than one, and by the third or fourth day the patient can take a full diet. Should the spleen be painful, a mustard plaster or turpentine stupe (p. 169) applied over the splenic area will give relief. Painting this area with the strong tincture (liniment) of iodine can be chosen as an alternative; except for those with delicate skins, the ordinary weak tincture is of little use.

The quinine will be gradually reduced to 10 gr. daily, and this the patient should continue to take without intermission for at least three months, whether he remains in the tropics or not.

The value of quinine is enhanced, and restoration of the blood-corpuscles hastened, by a tonic containing iron and arsenic.

Other drugs are used in treatment, and of these *Mepacrine* (= *Atebrin*) is in some respects better than quinine. It is given as 0·1 grm. tablets, one tablet three times daily for a week. It should be given after food. There is also a soluble form suitable for intramuscular injection.

Quartan Malaria

Distribution.—Common in some places, but not so widespread as benign tertian or subtertian malaria.

Cause.—Infection with the *Plasmodium malariæ*. Apart from its microscopic appearance, this parasite differs from *P. vivax* in but two practical points:

1. It requires seventy-two hours instead of forty-eight to reach maturity.
2. It does not enlarge the red cell in which it grows.

Clinical features.—Since the parasites take seventy-two hours instead of forty-eight hours to grow, it follows that, again counting inclusively, *the rigors will occur on every fourth day* instead of every third, hence the name quartan. Otherwise this form of malaria resembles benign tertian malaria in transmission, symptoms, prevention and treatment. Again, the temperature is unique in medicine, showing a rise in temperature and pulse-rate, followed by *two* days' clear interval before the next bout of fever (Fig. 8).

Subtertian Malaria

(*Also known as "Malignant Malaria"*)

Distribution.—More common in the tropics than in the sub-tropics.

Cause.—Infection with *Plasmodium falciparum*. The

life-history of this parasite is very similar to that of *P. vivax*, except that its rate of growth is more irregular, and when it bursts from the red cell it does so, not in the superficial blood-vessels, but in the deeper blood-vessels and capillaries, for example, those of the brain or intestines. For these reasons the fever rarely shows the regularity of the previous types, and the symptoms are more diverse, according to the part of the body most affected.

Symptoms.—Often, in chronic infections, fever is altogether absent, but the patient is lethargic, sallow, anæmic and generally far from fit. Though signs and symptoms may often be slight, there is no such thing as an insignificant case of subtertian malaria. However mild an attack may appear at the moment, the illness must always be considered grave because of its dangerous potentialities.

In an average case the fever is irregularly remittent, or may be continuous with remissions, running up to about 101° to 104° F. (Fig. 8.) A sallow, almost jaundiced, complexion, enlarged spleen, anæmia, drowsiness and headache are common, and vomiting is not infrequent. The chilly feeling and rigor of the other types may be absent; the sweating is irregular and follows remissions in the temperature, or may be present even when no rise in temperature has been recorded.

Treatment.—Such cases can be treated on lines similar to those already mentioned. From what has been said it is manifest that, no matter how mild an attack may appear to be, it must be treated, and treated with care and promptness, lest suddenly it end in disaster.

With the exception of patients in the pre-black-water state (*see* p. 20), the doctor will usually prescribe quinine freely, and the nurse may have previously received instructions about the administration of

quinine upon her own responsibility. In such cases she will be told, or should inquire, how it is to be given. In the absence of such instructions, she should not hesitate to give quinine to a patient showing cerebral symptoms, should medical aid not be immediately available. She should adopt the intramuscular method (p. 165), if ampoules are available, otherwise the quinine should be given by mouth if the patient is conscious or, failing that, per rectum. Careful general nursing is required, and the patient should be given plenty of bland fluids, such as barley-water or lemonade, the more the better. The mouth should receive careful attention, and the urine should be measured. In addition to these general measures, there are certain extra precautions in dealing with the more dangerous attacks (*vide infra*).

The Severe Forms of Subtertian Malaria

According to the site of the chief collection of the parasites choking the capillaries in that part of the body, the disease can assume any one of several dangerous clinical forms constituting the *pernicious* or *malignant* varieties of subtertian malaria.

For example:—

Blockage of brain vessels causes the *cerebral* forms.
„ „ liver and stomach vessels causes the *bilious remittent* form.
„ „ intestinal vessels causes the *dysenteric*, *choleraic* and *algid* forms.
„ „ heart vessels causes the *cardiac* form.
„ „ kidney vessels causes the *hæmaturic* form.

THE CEREBRAL FORMS

These may begin with convulsions or delirium, loss of concentration and co-ordination, simulating alcoholic

inebriation which may be further suggested by the patient's breath if he has recently taken spirits. The temperature, however, is above normal, and parasites can be found in the blood. Unless treated, the patient will soon pass into coma; indeed, coma may be the first sign of the attack, the victim being suddenly struck down and dying in a few minutes. Many instances of sudden death in the tropics, which formerly would have been put down to sunstroke, are now known to be due to the sudden onset of cerebral malaria. In any cerebral form, if prompt treatment is not forthcoming, the patient will surely die in a few hours.

Sometimes these patients appear first to have partial paralysis, sudden blindness or, not uncommonly, loss of memory.

Recovery under treatment may be complete; but occasionally serious after-effects are observed, such as persistent headaches, loss of memory, or even insanity. Another variety of cerebral malaria causes hyperpyrexia, the temperature rising to 107° F. or higher.

Special treatment.—Dentures should be at once removed. During the restless stage the patient should never be left alone, lest sudden delirium occur.

For all cerebral types, quinine must be administered promptly and, in addition, patients with hyperpyrexia must at once have their temperature reduced by cold baths (p. 151), cold packs, or cold spray (p. 160). The need for such measures is very urgent, but judicious care must be exercised lest collapse supervene; cold applications should cease when the temperature has been brought down to 102° F.

Sometimes the doctor will order guaiacol to be applied to one axilla and covered with protective. This will reduce the temperature, but is attended with the risk of collapse; the nurse must be on the look-out for this, and report at once any sudden pallor or drop in temperature.

THE BILIOUS REMITTENT FORM

In this form there is irregular fever, sometimes continuous like typhoid, accompanied by considerable prostration and severe persistent vomiting of bile-tinged fluid. It may be impossible to retain anything taken by mouth, so it is futile to depend for nourishment upon this route. Food should be given per rectum in the form of glucose, 2 oz. to a pint of water; strong coffee or brandy can be added as a stimulant. Sometimes a large drink of water, to which a teaspoonful of bicarbonate of soda has been added, will stop the vomiting, or at least, by washing out the stomach, serve to lessen the sickness.

The doctor may wish to give fluids intravenously, as saline, or a 5-per-cent. glucose solution; therefore the nurse should prepare her apparatus (p. 167). In these cases, too, quinine is usually given by the intramuscular or intravenous routes (p. 166).

THE ALGID FORM

These cases resemble nothing so much as severe surgical shock. There are the same pallor, clammy cold sweat, weak pulse and subnormal temperature. Occasionally there are, in addition, signs simulating those of an acute abdomen. There may be diarrhœa or vomiting.

There is little the nurse can do except keep the patient lying flat between blankets, supply hot bottles, give hot tea or coffee or, if the patient cannot take these, hot saline per rectum. In some cases a hot bath or hot pack is indicated (*see* p. 163).

Get the intravenous apparatus ready for the doctor's use (*see* p. 167). Quinine is urgently required, and may be given intramuscularly (*see* p. 165), or intravenously.

THE CHOLERAIC AND DYSENTERIC FORMS

With these forms, also, the patient is very much prostrated and may have either a high or subnormal temperature, according as the degree of shock is lesser or greater. There are cramp-like pains in the abdomen and profuse diarrhœa, with or without mucus or blood. This causes a severe drain on the patient's strength, and the amount of collapse can be judged from the general aspect as he lies in bed with sunken cheeks and eyes, fast, thready pulse, shallow breathing and intense thirst.

Attempt to warm up the patient if the temperature is subnormal and give copious hot drinks. The bed-pan may be too exhausting; if so, pack around the patient's buttocks tow, wool or old rags; burn these every four or six hours, wash the patient and renew the packing.

As quinine will probably be given intramuscularly or intravenously, have the intravenous apparatus ready (*see* p. 167), and encourage the patient with the knowledge that the quinine will afford speedy relief.

THE HÆMATURIC FORM

This is a rare form and must not be confused with blackwater fever, from which it is distinguished by the fact that the urine contains blood-cells, not merely hæmoglobin. The nurse can recognize the difference by sight with the aid of a very simple test.

Freshly-passed hæmaturic urine is bright red *and cloudy*, and it remains cloudy even if diluted *with normal saline* (diluting with water spoils this test); whereas blackwater urine may be red or the colour of stout, but is clear and translucent or, if not, will become so when diluted with normal saline.

Associated with the hæmaturia are severe loin pains, headache, and perhaps vomiting, for the condition is really one of acute malarial nephritis and is seen more commonly with quartan infections. The quantity of urine may be increased or diminished.

TREATMENT.—For purposes of treatment, apart from the administration of quinine, which should be given promptly, the nurse can regard such cases as ordinary acute nephritis. Plenty of fluids should be given, and hot foments or dry cupping (*see* p. 171) applied over the loins. If suppression of urine is threatened, the nurse may be ordered to apply heat to the kidneys from the inside. This is done by copiously irrigating the colon with saline at a temperature, in the jug, of 120° F. About two pints are run into the bowel, and then syphoned off, the process being repeated two or three times. During the administration the patient should be lying on his back with the buttocks slightly raised. Hot packs may also be required (p. 163).

For diet, the nurse should obtain instructions from the doctor; pending these, the patient should be kept on milk, barley-water and fruit juice.

THE CARDIAC FORM

This may take the form of sudden syncope and death, or severe fainting attacks with a weak fluttering pulse. Stimulants, such as sal volatile, camphor, digitalis and strychnine, should always be ready. It is advisable to keep the foot of the bed somewhat raised. Absolute rest of the body and limbs must be enjoined, and the patient must do nothing for himself. On no account must he be raised from the recumbent position until some time after an attack. Indeed, the nurse should not sit the patient up in bed without being very clearly authorized to do so, as fatal syncope may ensue.

Other Manifestations of Malaria

Having now discussed the outstanding clinical features of all three types of malaria, we can turn to some considerations which may affect individual patients, irrespective of the type of malarial parasite present.

1. *Pregnancy.*—In the tropics, malaria is a common cause of abortion or premature labour. In this connexion it is a popular fallacy that the administration of quinine causes abortion. The fact is that the malaria, not the quinine, provokes the disaster, for the blood on the maternal side of the placenta teems with parasites. If mepacrine is not available, quinine may be used in small graduated dosage, starting with 5 gr. In addition, the same care must be enjoined as for any threatened abortion: strict rest in bed, light diet and no purgation. Especially must the patient avoid any chills or fatigue.

Should labour occur, an infected mother will usually give birth to an uninfected child, but occasionally accidental infection occurs through abrasions. Sometimes the child is still-born.

Infection cannot be transmitted through the mother's milk, and a very small proportion of the quinine given to the mother will reach the baby this way.

2. Rupture of an enlarged malarial spleen is not very uncommon. It is a fatal accident unless immediate operation is possible, when the spleen is removed or the rent sutured. Laparotomy instruments and intravenous saline and apparatus (*see* p. 166) should be ready, and a blood transfusion may be required (p. 158).

3. Chronic ill-health, with anæmia and an enlarged spleen, may follow repeated attacks of malaria improperly treated, the condition being known as *malarial cachexia.*

4. Any circumstance lowering the general resistance of a person in whom malaria is latent is apt to light up an attack. Notorious in this respect are surgical

operations, childbirth, wettings, exposure to cold, overfatigue and hunger.

5. The debilitating influence of malaria markedly disposes the patient to infection with other diseases, notably tuberculosis.

6. After a patient has quitted a malarial country for three or four years the disease dies out of its own accord. True recurrence of malaria after this period is exceedingly rare, although by old tradition and popular fancy the patient is still thought to "harbour it in his bones." The basis for this mistaken idea is the curious and unexplained fact that many an illness in a one-time malarial subject is wont to commence with a rigor, and so clinically resembles malaria; thus, the onset of an ordinary cold or attack of influenza, even tuberculosis or endocarditis, appears to the patient and his friends to be a recurrence of malaria, and it may be very difficult to convince them to the contrary.

7. Malaria is modified in children; for them any type is serious and may be fatal. Before an attack there may be lassitude and fretfulness, drowsiness with yawning, and anæmia, and the child may feel cold; but these signs may all be absent, so that, without any warning, a sudden attack of vomiting or convulsions occurs. An onset of this character, occurring usually in the forenoon, is very typical; there is frequently no rigor. We find a burning little body with high fever from the start, and hyperpyrexia may follow. The fever is irregular, and a typical chart is rarely seen. Hot sponging and ice to the head may check the convulsions, and later a dose of castor oil or grey powder may be ordered. The necessity for quinine is very urgent. The dose for an infant is usually one grain, and an additional grain can be added for each year up to the age of five.

When changing the child's clothes take great care to avoid any sudden chill of the body.

8. An interesting application of malaria is the treatment of general paralysis of the insane (G.P.I.). In such subjects benign tertian malaria is deliberately induced and fever allowed to proceed until the patient has had about ten rigors, when it is cured by quinine. Curiously enough, in such cases the quinine nearly always effects a permanent cure. The treatment is given somewhat on the principle of protein-shock (p. 168), and up to the present is the only treatment for G.P.I. which has given any satisfactory result. A nurse in charge of such treatment, while the malarial fever is present, must keep a keen watch on her patient, as dangerous collapse may come on with little or no warning. Camphor in oil and strychnine should be kept ready.

Diagnosis of Malaria

The discussion of the diagnosis of malaria has been left to the last for two reasons: first, in order that the more important features of all three types of malaria and their treatment may be passed under review; and secondly, because, by placing the details of the diagnosis in a separate section, it is possible to convey a stronger impression of their importance. A nurse abroad should endeavour to make herself reasonably competent to recognize clinically all three types of malaria and, given the opportunity, an efficient nurse will soon learn to identify the parasites under the microscope. Certainly every nurse should be able to make a blood-film. Let her not be satisfied merely to know how this should be done; perfection in the art requires much practice. (*See* p. 154.)

The diagnosis of malaria is usually easy, yet upon occasion the doctor can encounter no more difficult problem in the tropics than the diagnosis of some bizarre case. Far more serious mistakes arise through the

diagnosis of malaria being made when it is not present, than occur because the correct diagnosis of malaria has been missed. For example, a patient with trypanosomiasis was encountered who had been treated with quinine, as a case of malaria, for almost two years, despite the absence of improvement; and only too often does the doctor come across patients with phthisis or endocarditis labelled "malaria."

It is, of course, extraordinarily tempting to regard malaria as the cause of innumerable ills, and the tropical resident who gets a little temperature is much given to saying that he had a "touch of fever," or a "touch of malaria," these expressions in the tropics being popularly synonymous. Usually his statement will prove true, but not always, and the diagnosis must be verified.

Lastly, it must never be forgotten that malaria and one or more other diseases frequently co-exist.

Clinical Diagnosis

The temperature chart.—This is the most important of all the clinical criteria in diagnosing benign tertian and quartan infections, and in distinguishing them from each other. (Fig. 8.) An uncomplicated chart cannot well be mistaken for anything else, while even in a double infection a fairly certain diagnosis can be made. This is not true, unfortunately, of the chart of a subtertian infection; here the temperature is remittent, often in an irregular manner, but there is a tendency for it to rise higher on alternate days, and the pulse-rate rises, and falls along with the temperature. Also, the highest temperature in the twenty-four hours is likely to be recorded before 2 p.m. These points are suggestive but not diagnostic.

Anæmia.—From the nature of the disease this must be present, and may be very marked.

Splenic enlargement.—The spleen will be palpable and may be tender in any well-established case, but not at the beginning of a first attack.

The colour of the skin.—In the dark races this is

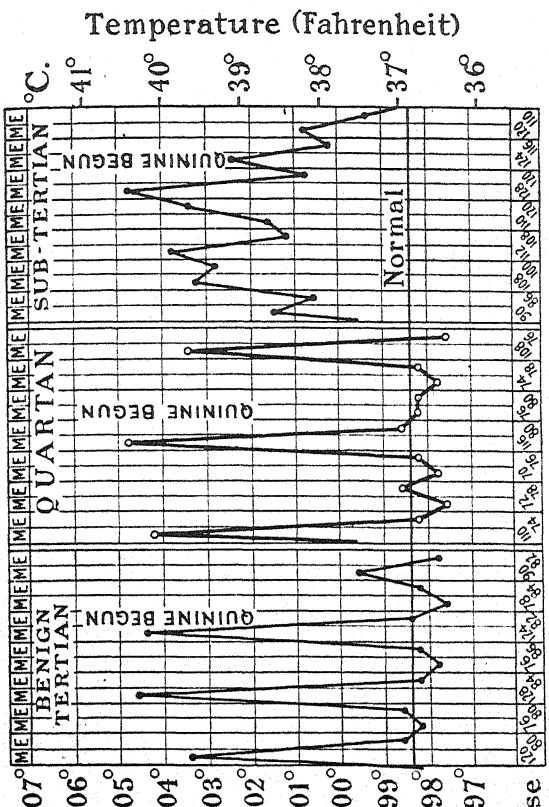


Fig. 8.—Three charts showing characteristic malarial fevers. (*Orig.*)

little help, but in white people the change is quite striking. There is a sallow appearance amounting almost to jaundice. It is not, however, a true biliary jaundice, being caused by the hæmoglobin set free in the blood-stream from the broken-down red corpuscles, and not by bile as in obstructive jaundice. The urine in such cases is dark, but does not give the ordinary tests for bile.

The attack.—The orderly sequence—rigor, heat, sweatings is very characteristic, but is not always seen, especially in young children in the subtertian variety.

The therapeutic test.—This, of course, must only be carried out by the doctor; but for the result he may rely upon the nurse's reports. There are only certain conditions which justify this test, viz., the inability to examine the blood by microscope; the presence of pyrexia for which, after careful observation, no definite cause can be found; and lastly, urgent cases where malaria is suspected and laboratory confirmation would require too much time.

To employ the test as a routine measure is bad, for a difficult diagnosis may thereby be rendered still more obscure. Briefly, the test is to administer full doses of quinine and watch the result. If the temperature rapidly comes down to normal and stays there, and at the same time there is an obvious clinical improvement, it is fairly safe to conclude that the pyrexia was due to malaria. If, however, the improvement is partial only or absent after vigorous treatment for one week, some other disease is to blame for the fever, whether the patient has malaria or not.

It never can be sufficiently emphasized that *any fever which resists quinine, properly administered, is not caused by malaria*, being usually caused by a urinary infection, tuberculosis, liver abscess, typhoid or other infection.

Laboratory Diagnosis

Without special training in the use of a microscope a nurse cannot expect to avail herself of this means of diagnosis, but in competent hands it is the one unequivocal way of diagnosing each form of malaria. If the parasites are in the blood they can be recognized. It is repeated for emphasis, however, that every nurse abroad should be able to make blood-films with dispatch and certainty (*see* p. 154, *et seq.*).

Quinine

Quinine is an alkaloid prepared from cinchona bark, and for years has been used for treatment of malaria. The pure quinine alkaloid itself is not used, but one or other of its many derivatives which are on the market and with which it will profit a nurse to be conversant. The three "official" salts of quinine, i.e. the three forms mentioned in the British Pharmacopœia, are quinine sulphate, quinine hydrochloride, and quinine bihydrochloride; and when the word "quinine" is used in this book it must be understood that it means any one of these three forms, unless there is definite mention to the contrary.

Quinine sulphate.—This is the cheapest form obtainable, and is a light white powder which is very sparingly soluble in water (1 in 800), and when dissolved forms a pale-blue fluorescent solution. The addition of an acid makes it dissolve quite readily. This is a point worth noting, for if quinine has to be given and only the sulphate is obtainable, a nurse may well be nonplussed by the insolubility of the drug. If she can obtain some ordinary vinegar the matter is simple, for she has only to weigh out the required dose,[1] put it in a glass with some water, add 20 to 30 drops of the vinegar, and stir till the powder is dissolved. The addition of a little antipyrin also helps the quinine to dissolve, but antipyrin, being a potent drug, must be used with discretion.

Quinine sulphate is also put up in tablets; owing to their insolubility, however, these are usually worthless if swallowed whole, simply passing out in the stools as would so many stones. They are only permissible if, before being swallowed, they are

[1] A nurse in the tropics should be so familiar with the bulk and appearance of a 10-gr. dose of quinine, that scales, often unobtainable, become unnecessary. Ten grains in powder will just stay on a penny.

crushed up and dissolved. There are few exceptions to the general rule that *quinine should always be taken in liquid form.*

Quinine hydrochloride.—This is similar in appearance to the last salt, but more readily soluble in water, 1 in 36. The solution in this case is not fluorescent. It is more expensive but, because of its greater solubility, is a more convenient drug. As with the sulphate, the addition of an acid aids solution.

Quinine bihydrochloride.—This is similar to the others in appearance but is extremely soluble in water, 1 in 1. It is much more expensive, and its use is confined mainly to intramuscular and intravenous injections (*see* pp. 165, 166). As already suggested, quinine injections are only occasionally used in benign tertian or quartan malaria, their real value being in the subtertian type.

Tablets of this preparation, if non-coated, may be swallowed whole; but it is much better to maintain the rule—no solid quinine of any kind.

The official dose of quinine is 1 to 10 gr., and it is convenient to remember that each of the three preparations of quinine just mentioned has the same dose: it is for these preparations that the doses previously mentioned in treatment are intended. Fifteen grains, and sometimes larger doses are given, but more than 30 gr. in the twenty-four hours need not be given, and may be harmful.

Other preparations.—Many unofficial derivatives of cinchona bark are in use, the following being among the better known:

Quinine bisulphate: soluble in water 1 in 11, hence better than the sulphate, but more expensive.

Quinine hydrobromide: note that the dose of this is only 1 to 5 gr. It resembles the hydrochloride in solubility, 1 in 40, and is said to reduce the risks of cinchonism.

Cinchonine and cinchonidine: two alkaloids somewhat weaker than the alkaloid quinine but otherwise rather similar.

Euquinine: a white powder which has the advantage of being almost tasteless. The dose is 3 to 15 gr.

Quinidine: another alkaloid resembling quinine.

Warburg's Tincture: a favourite remedy with some doctors. It contains a large number of tonic and flavouring drugs, but its chief virtue resides in its quinine. Patients can sometimes be induced to take this when they flatly refuse to take quinine.

THERAPEUTIC ACTION OF QUININE

(1) *On the malarial parasites in the blood-stream:* Even when a patient's blood is teeming with benign tertian or quartan

parasites, efficient dosage of quinine will cause them to disappear. That they are not destroyed completely throughout the whole body is certain, for should the quinine be withheld for a time the parasites will probably reappear; while quinine is being given in correct dosage, however, benign tertian or quartan parasites are not found in the blood. The ring forms of the subtertian parasites likewise disappear, but the crescents persist for about three weeks, no matter what dose of quinine be given. In this respect, plasmoquine is superior to quinine.

(2) *On the patient:* Here the action is even more striking, for the malarial fever is stopped as if by magic. Therapeutics know no greater triumph than the action of quinine on the malarious subject. To the nurse in the tropics it is this attribute of quinine which is all important, but its other virtues are manifold and should not be neglected. Careful perusal of the therapeutics of quinine in any Materia Medica will prove both helpful and interesting. The drug is excreted principally in the urine, but also in minute quantities in the bile, saliva, tears, and in the milk of nursing mothers.

Cinchonism.—This is the term applied to a condition which may follow large doses of quinine. Individual susceptibility to the drug varies considerably, and 10 gr. may produce more unpleasant effects in one person than would 30 gr. in another. Evidence that the limit of tolerance is being reached is ringing or buzzing in the ears and slight deafness. Larger doses will aggravate these symptoms, causing, in addition, severe headache and giddiness. There may also be temporary blindness and weakening of the heart's action. If this stage is reached the drug has been pushed too far and should be stopped.

Occasionally, quinine will produce an erythematous rash and, as the drug has a selective action on the auditory nerve, it should be exhibited with caution when the patient has middle-ear disease.

Quinine cyst.—Quinine should never be given as a hypodermic injection, for it is very apt to cause suppuration or a lump under the skin, which remains to form a little cyst. When this happens the injection is a twofold failure, as the quinine remains in the cyst and so fails to enter the system.

Quinine abscess.—Quinine for intramuscular injection has one unfortunate disadvantage in that it causes definite local damage to the muscle tissue, so paving the way for growth of any organisms which may reach the damaged part by way of a dirty needle or contaminated solution, or septic organisms reaching the part from the patient's own blood. An unsterile injection can, and must, be prevented by proper asepsis.

A so-called "quinine abscess" is a most unpleasant experience for the patient, being very painful, very destructive, and slow in healing.

Treatment.—Fomentations should be applied. The abscess may require surgical intervention, and must be reported at the first opportunity.

Idiosyncrasy.—Some people cannot take quinine without symptoms of cinchonism, but they are few and far between. There are many, however, who think they cannot do so, and for such folk many anxious hours may be smoothed over by a little harmless deception. The chief obstacle to this lies in the well-known taste of quinine which is difficult to disguise, but with these worries the doctor must deal.

The few patients who really are harmfully affected by quinine are troublesome, and the exact results of a small dose must be carefully noted and reported to the doctor.

Mosquitoes and Malaria

There is only one genus of mosquito which is known to carry malaria, the anopheles, but of these there are many varieties, and their recognition requires time and study. Even if a mosquito is not carrying malaria, it may be infected with some other disease; at the best it is only a nuisance. Therefore the nurse can safely look on all mosquitoes as enemies, and she should know how best to protect her patients and herself from their unwelcome attentions.

Prevention of Malaria

1. Measures directed towards eradicating the mosquito:

Water.—Mosquitoes lay their eggs in fresh water practically wherever and whenever it be found; therefore no water must be left uncovered near or in the house. This, however, is by no means easy to ensure, for water will collect in all sorts of odd corners, such as tree-stumps, old tins or flower-pots, quite apart from larger ponds or swamps, with which the nurse is not concerned.

For the nurse, conscientious attention to the odd little collections of water in and around the house is the most important of all protective measures.

Fly Swatting.—Destruction of the adult mosquitoes is very good tactics, especially if one looks for them during the day-time in the shady rooms and in the darker parts of those rooms, such as behind furniture or hangings, or under the seats of chairs.

Fumigation is also used, but often it succeeds only in stupefying the mosquitoes; they must be swept up and destroyed before they revive.

2. Measures to protect the personnel:

Netting around the bed is essential, and it is well to remember:

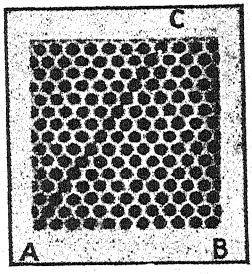


Fig. 9.—To show method of counting mesh of mosquito netting. The total number of holes along the lines AB and AC is the mesh of the net: in this case 11 + 15 = 26. The hole at A is counted twice. (*MacArthur; Jl. R.A.M.C.*)

(*a*) To select a net with a correct mesh. This is best done with the aid of a piece of paper in which a hole 1 in. square has been cut. Place the paper on the net so that the bottom edge of the hole is along a thread of the warp with a woof (or bobbin) thread meeting it at the bottom left corner. (*See* Fig. 9.) Then count the number of holes along each thread within the square inch, counting the left corner hole twice; the total number of holes is the number of the mesh. In a net woven of about 30/60 cottons, the mesh number should be 25 or 26. The net, too, should have a double frill

or canvas skirt around the bottom; otherwise a limb pushed out against the net will be bitten furiously by the mosquitoes which alight on the outside.

(*b*) After getting inside for the night, to see that no living mosquitoes have got in also. An electric torch is useful for this purpose.

(*c*) To see that the net is tucked in, not left loose.

Mosquito boots.—These should be worn, where practicable, especially in the evenings or on night duty, or else two pairs of stockings.

Hours.—In malarial districts one should go abroad as little as possible after sundown, because the anopheline mosquitoes are most bloodthirsty at night.

Repellent scents.—These have their uses, but they very soon evaporate or get rubbed off, so that their efficacy is of short duration. As long as this is understood they may be used with advantage. A useful one is:

Oil of cinnamon	℥ii
Oil of cajuputi	℥i
Formalin	℥i
Spt. vini meth. ad	℥iv

Rubbing the skin with a cut lime and allowing the juice to dry is said to be excellent for keeping away mosquitoes.

Prophylactic quinine.—There is divergence of opinion on this subject, which may be summarized thus: taking quinine regularly is probably not harmful in small doses, but these will not necessarily prevent malarial attacks, though they may help to do so; taking quinine *irregularly* in large doses in a district where blackwater fever occurs is highly dangerous (*see* p. 19).

If a person is in the habit of taking quinine regularly while abroad he should continue to take it for at least a month after leaving the country, as malaria frequently breaks out on the voyage home or upon reaching the colder climate.

MYCETOMA OR MADURA FOOT

Mycetoma, also known as "Madura foot," is a fairly common condition occurring in many parts of the tropics, and is caused by infection with various forms of fungus akin to that which causes actinomycosis.

The foot, or more rarely the hand, is attacked, and the result is a slow form of chronic suppuration which causes enlargement of the part, and results in gradual destruction of the tissues and bone, with multiple discharging sinuses. The condition is not usually painful but is very disabling, and if the part affected be not amputated the disease will eventually lead to death from chronic suppuration.

Other than amputation there is as yet no very satisfactory treatment. The diagnosis is made by finding the fungus in the discharge from a sinus. The disease is usually found only among the bare-footed native population.

PELLAGRA

Pellagra is a disease of malnutrition, or food deficiency, and occurs in most countries among the poorer classes.

It is characterized by a chronic illness which usually commences in the spring or autumn, recurring with increasing severity about the same time each year and associated with a peculiar sunburn-like rash upon the exposed parts of the body. During the course of the disease a patient's mental condition is affected, causing him to become stupid and irritable, while his digestion is completely upset so that there is much flatulence and abdominal pain, together with diarrhœa. Not infrequently the stools become light-coloured and the mouth sore; hence, in many respects, the disease resembles sprue.

As the disease progresses a patient may show maniacal or suicidal tendencies, and therefore requires watching.

Treatment consists in attention to sanitation and diet, plenty of good protein food being allowed. Medicinally, arsenic has proved valuable, and nicotinic acid or other vitamin B preparations.

PLAGUE

This dread disease was rife at one time in most parts of the world, but now, except for occasional cases, is mostly confined to Russia and the tropics, being endemic in parts of India, Africa, and the Far East.

Cause.—The disease is the result of infection by the plague bacillus (*B. pestis*) either through an abrasion of the skin, however minute, e.g. a fleabite, or by inhalation.

Modes of infection.—1. Plague is a disease of rats and fleas, and would be restricted to these pests if only they could be kept away from man. Unfortunately, rats, with their attendant fleas, are attracted by human habitation and, as rats and plague go together, man is likely to become affected.

In plague districts, many rats are infected with the plague bacilli, and the fleas, which all rats carry, become infected from their hosts' blood. Sooner or later these infected rats die; then their fleas must find new hosts. If other rats are available, well and good; the infected fleas simply attack and infect these rats; but if a human being is encountered by a hostless flea, the flea, though it would prefer a rat, is not averse to the taste of man; it promptly bites its new host and thus infects him with plague.

The fleas are rat fleas, not human fleas—which belong to a different species—and do not ordinarily infest man but, as they must leave a dead rat when it becomes cold, they may then transfer themselves to man. It follows that a newly-dead rat is a source of great danger.

2. When a person has plague, the saliva and all excretions are infective, and consequently the nurse may become infected through handling a patient if she has any cuts or abrasions on her hands. This may be regarded as an accidental mode of infection, and should not be a source of danger if the nurse takes proper precautions.

3. Plague in one of its forms attacks the lungs, and in such cases the patient's breath and expectoration teem with bacilli and are extremely infective. It is this, the most deadly, type which is acquired by inhalation.

Clinical types.—There is one form of plague, known as *pestis minor*, in which the patient may be so lightly affected as to be unaware that he is ill or, at most, to think that his affection is merely some trivial swelling of the groin glands. Such a person is in no great danger, but may be a source of grave infection for other people.

The ordinary forms of the disease, known as *pestis major*, are of three types:

1. *Bubonic plague.*—This is the common form. The incubation period is about one week from the time of infection. The onset is sudden, with a feeling of intense illness and prostration. Headache, aching of the limbs and a great thirst set in, accompanied by a high temperature. At the same time a group of lymphatic glands becomes inflamed, giving rise to a *plague bubo*. This bubo rapidly increases in size and severity, and the patient becomes more and more stupid and prostrate from the intense toxæmia; a rash consisting of bright petechiæ (hæmorrhages under the skin, which do not fade on pressure), may come out on the body. The temperature remains high throughout, the pulse soft and running, and the patient dull and stupid or comatose. Occasionally there may be violent delirium.

If the patient is going to recover, the bubo settles

down or, more commonly, suppurates, resulting in a foul ulcer.

Even in this, the mildest type, the mortality is high.

2. *Septicæmic plague.*—This form occurs when the resistance is very poor or the initial infection very virulent. From the outset the person is overwhelmed by the disease and dies in a few hours, before the buboes have time to form.

3. *Pneumonic plague.*—This type, like the last, has a mortality of 100 per cent. The patient is suddenly attacked with what seems to be ordinary acute pneumonia, but the sputum, although bloodstained, is profuse and watery, unlike the typical rusty, tenacious sputum usually seen in pneumonia. Death occurs in a few days. Anyone approaching such a patient, unless adequately protected, is more than likely to contract the disease, the atmosphere being laden with germs from the patient's breath. Occasionally a patient suffering from bubonic plague develops pneumonia, and it is such cases that form the original source of infection for an outbreak of pneumonic plague.

Treatment.—The introduction of sulphapyridine and kindred drugs has greatly lessened the dangers of plague infections. They are given in large doses which must be continued for several days after the temperature has fallen.

Nursing can be safely undertaken by those properly protected, and is that of any severe fever, with the addition of such foments or dressings as the buboes may require.

Absolute cleanliness and free use of antiseptics are required. The patient should be isolated in bed, and given such light diet as can be taken, as well as plenty of water. Antiseptic cleansing of the mouth should be frequently employed. Unless great care is taken, bedsores may develop.

Prophylaxis.—This is by far the most important branch of the treatment, as without it many people, including the attendants, are likely to be stricken.

Prophylaxis may be described under three heads: (1) general; (2) concerning the patient; (3) concerning the attendants.

1. *General prophylaxis.*—Where there is any suspicion of plague, the most determined war should be declared upon rats. Houses should be made rat-proof, and the greatest precautions taken that no food for rats is available anywhere near the houses. Traps and poisons should be used. The traps should be visited frequently, and may advantageously be of a type which catches the rats alive. The rats so caught are destroyed by plunging the trap into a bucket filled with strong antiseptic solution so that every part of the trap is submerged. After half-an-hour the trap may be taken out and the rats either sent for examination or deeply buried. Where poison is used, constant search must be made for dead rats so that they may not be left lying long after death; otherwise the fleas will disappear. Once a dead rat is discovered it should be well drenched with strong antiseptic, then picked up with a pair of tongs and dropped into a bucket of the same solution. More antiseptic must also be poured over the spot on which the rat was lying; because, before forsaking the rat, the fleas collect beneath it where the heat lasts longest.

At all times the greatest cleanliness must be insisted upon throughout the house. Fumigation, if carried out efficiently, is of service. Cats should be banished, as they also can convey plague. Persons engaged upon rat destruction should wear boots with high tops and rubber or leather gauntlets. None but authorized attendants should be allowed in the same locality as a case of plague, nor may the attendants or contacts mix with other people until they have had a quarantine period of ten days.

2. *Prophylaxis for the patient.*—If possible, remove a patient at once to a proper isolation hospital; failing this, place him under temporary shelter which should be well ventilated, or in the open. Burn every bit of the original clothing and bedding; indeed, a native hut is best burned entire, taking care to kill and throw back into the fire any rats which may escape. When washing the patient pay particular attention to the hair, which should be close cropped.

Remember that all the excreta or discharges are infective and must be disinfected or burnt; likewise all dressings from buboes.

For pneumonic plague keep the room atmosphere as dry as possible, and ensure good ventilation.

3. *Prophylaxis for the attendants.*—Everyone in contact with plague must be protected by high boots, gowns and rubber gloves, while for nursing pneumonic patients, goggles and thick masks to protect the eyes and mouth are essential: indeed, while the nurse is in the vicinity of the patient, they must never be laid aside, not even for a moment. Unnecessary handling or close contact with a patient should be avoided.

Inoculation with a vaccine is of the utmost protective value and all persons in plague areas should be inoculated, even though it is a somewhat unpleasant experience. This protection, however, lasts only for some three months, when it should be repeated.

RABIES

Rabies is a disease to which dogs, cats and some other animals are subject. It occurs all over the world, but is more common in hot countries. The cause is a definite infecting organism which is conveyed to a fresh victim either by the bite or through the saliva of an infected animal.

The disease occurs most commonly among dogs; and an infected dog can be recognized by its becoming irritable, snappish, and inclined to mope about in dark places and eat earth and all sorts of rubbish. In a few days its mouth becomes filled up with thick ropy saliva and paralysis sets in, soon to be followed by death. Occasionally, before the last stage, the dog goes mad and runs about biting everybody and everything within reach. A dog believed to be infected should be killed immediately, unless it can be kept in restraint under skilled supervision.

The local health authorities should always be notified, and if the dog is killed its body should be turned over to them at once for examination. When this is not possible the body should be burned.

A person bitten or licked by a rabid dog is likely to be infected with the disease, which in human beings, however, is known as hydrophobia.

Hydrophobia

Any person bitten by a rabid dog, or otherwise likely to be infected, should be sent *at once* to the nearest station where treatment by Pasteur's method of inoculation can be obtained. Such stations are becoming more and more numerous in the tropics.

There is no other cure; nor will this treatment be of any avail if delayed too long.

RELAPSING FEVER

In various parts of the tropics there occur fevers which, in general, resemble each other and are caused by similar organisms called the relapsing-fever spirochætes. These minute organisms can be seen in the blood, but the blood-smear must be made from an infected person during a bout of fever.

The type of fever varies according to the part of the world in which it originates and the identity of the spirochæte of that particular district; thus there are the European, the Persian, the American and the African forms. It will suffice, however, for the purpose of description, if only the general features be described, as the variations between types are of relatively small importance.

Infection ordinarily occurs through the bites of vermin—lice for the most part, but the African disease is conveyed by ticks. It is possible, however, for the infection to be acquired directly from the patient's blood, so that the nurse should exercise care, when carrying out any injection or dressing, that no blood comes in contact with her skin.

Clinical course.—After an incubation period of two to ten days the patient is suddenly attacked by a sharp fever which rapidly mounts to 104° F. or higher, at which level it remains for some three to seven days, according to the type. The attack terminates in a crisis, but recurs in a similar manner after an interval of four to eight days. There may be few or several such bouts of fever before the disease leaves the system, during any one of which the patient may die, either directly from the effects of the disease or from some complication.

During the bouts of fever the patient feels extremely ill and suffers from severe headache, intense thirst, loss of appetite and a dry tongue. There is almost always some bronchitis, and broncho-pneumonia is to be feared. Epistaxis is not uncommon, especially at the crisis, at which time the patient is liable to collapse or sudden syncope. A dusky-red mottled rash is occasionally seen over the neck and shoulders. The pulse throughout the febrile bouts is full, rapid, and bounding.

Treatment.—The patient should at once be freed from vermin, and his clothing sterilized or burned.

If the hair of head and body is cut close and treated with oil of sassafras, and the patient thoroughly washed, he will be effectively freed from lice. Unless the hair has been cut close it should never be considered free from lice until it has been systematically gone over with a fine-toothed comb; an ordinary comb and brush are quite inadequate.

The actual nursing is that of any fever. Sponging is soothing, and an ice-cap, if available (*see* p. 165), may be applied. Administer copious supplies of bland fluids but, during the febrile periods, only light nourishment in small amounts should be given. The bowels may require a saline aperient, constipation being the rule, though there may be diarrhœa or even dysenteric motions. The patient should be kept in bed both during and between the attacks. Stimulants may be required at the approach of the crisis.

Medicinally, the disease is one of the most satisfactory to treat, one or two injections of novarsenobillon or "606" effecting a speedy and permanent cure. The injections are best given between the bouts of fever or early in an attack, for if given towards the end of a bout the drug is likely to precipitate the crisis and cause collapse and death.

SANDFLY FEVER

This illness takes the form of a sharp bout of fever lasting three days or more, and leaving the patient for a few weeks rather debilitated and subject to headaches and brain-fag. The disease is very likely to attack newcomers to a district where it is endemic.

The germ is conveyed by a sandfly, a species of midge known as a phlebotomus.

The fever develops suddenly with a rigor and intense pains in the head and around the eyes, which are very

bloodshot. There are general pains and stiffness over the body. The pulse is rather slow, and blood examination shows a slight leucopenia. The patient is depressed and drowsy. As the temperature falls, profuse sweating or nose-bleeding may occur.

The diagnosis cannot at first be made with certainty, but the absence of malarial parasites in the blood, and the failure to develop a rash, exclude malaria and dengue, while the rapid recovery is against typhus and enteric. Influenza is, perhaps, least easily differentiated.

Treatment.—Little can be done except to ease the patient's headache by antipyrin and opium. Cold sponging is refreshing, but at first no movement of the head can be tolerated.

Shield the eyes from the light.

Give plenty of water to drink, and a little fluid nourishment in the form of milk and barley water, soups, etc.

Prevention.—Nets, to be of use, must be so fine that they are wellnigh stifling and therefore impracticable.

A current of air from a fan will keep away the sandflies. An upper-story room is desirable, as these pests do not fly much higher than 10 ft. from the ground.

For keeping away the sandflies, Choyce recommended 5–10-per-cent. thymol made up with wax of suitable melting-point into a stick or candle which can be rubbed over the skin without causing it to appear greasy.

SCORPION-STING AND SPIDER-BITE

Scorpion-sting is not an uncommon happening in the tropics. It is a very painful experience, and quite dangerous for children.

Piles of rubbish or stacks of wood should not be carelessly disturbed, and boots or shoes should never be put on without first shaking them to discover any lurking scorpion.

The poison from a scorpion is akin to, but weaker than cobra venom, and an antitoxin has been prepared. This, or incision and washing out the wound with a strong solution of potassium permanganate, may be used to treat a sting in a child; but for adults relief can be obtained by touching the spot with strong ammonia.

Spider-bite is less common, but can be very poisonous. The wound should be immediately washed with strong permanganate solution.

SNAKE-BITE

Snake-bite is common in the tropics, but the consequences are not so dire as generally supposed. The greater number of snakes are non-poisonous and, apart from the risk of septic infection, their bite is comparatively harmless. Again, even the poisonous snakes are not all capable of causing death, while those whose venom is sufficiently powerful to cause death may not, for various reasons, succeed in injecting a fatal dose. Nevertheless, a bite from a snake is always alarming, and the nurse, while encouraging the patient and endeavouring to calm his fears by her assurance and demeanour, should lose no time in rendering first aid, and must consider every bite poisonous unless the contrary is proved.

If possible, information as to the snake or type of snake which bit the patient must be obtained. Such knowledge is of vital importance and settles the two questions:

1. Was the snake poisonous?
2. If so, did it belong to the Viperine or to the Colubrine group?

The poison or venom of the snakes in these two groups differs widely in its effects, and the anti-venom, or anti-venene, as it is called, for one group,

is useless for the other. The venom from the Viperine group, of which Russell's viper and the rattle-snake are examples, affects the blood-vessels and circulatory system, causing intense inflammation around the bite with extravasation of blood, clotting, and later, perhaps, gangrene. There is also a general bad effect upon the circulation, causing a fall in blood-pressure with collapse and loss of consciousness, a thready pulse and dilated pupils. Even if the patient recovers from the general collapse, the local condition remains grave.

On the other hand, the venom from the Colubrine group, of which the cobras are the best known, causes little or no local trouble beyond pain, but affects the general nervous system, causing faintness, vomiting, drowsiness and, finally, paralysis of the cardiac or respiratory muscles. If, however, the patient can be kept alive until the effects of the venom begin to wear off, a good recovery without any ill-effects can be anticipated.

Treatment.—If the bite is on a limb, apply a tourniquet at once between the bite and the trunk. If this is done immediately, it will allow a few moments for consideration of the next step. Next inspect the bite. Poisonous snakes will usually leave two deep punctures and no others. At the same time obtain a description of the snake and decide, if possible, whether the bite was from a poisonous variety and especially whether from one known to be deadly. Upon this decision must depend the further treatment of the case. One or more of the following measures may be necessary:

Amputation.—If the bite is on a finger and the snake is known to be dangerous, prompt amputation is indicated; in remote districts where anti-venene injections are unavailable, and a bad bite has been inflicted upon the arm or leg, even a limb may have to be sacrificed to save life. Time will not permit, however, of waiting

to see whether this prove to be necessary; the decision must be immediate or it will be too late. Such treatment is, of course, primitive and brutal, but so are the circumstances, and rapid amputation by a large knife or an axe is preferable to death. After amputation the stump should be freely washed with a weak antiseptic saline solution (made, for example, by adding 60 drops of tincture of iodine to a pint of sterile saline) and dressed with the same or with whisky until medical help can be obtained. Hæmorrhage must be controlled first with a tourniquet, later by local pressure or by ligating any main vessels which can be seen to bleed. Ordinary cotton or, better, linen thread, which has been boiled will serve for ligatures; but when the doctor arrives he must be notified that these have been used.

Incision.—If amputation is not considered necessary lay open freely the area of the bite by a bold incision and loosen the tourniquet for a minute to encourage bleeding. Then tighten the tourniquet again, and rub into the cut crystals of potassium permanganate; rub them in copiously with a heavy hand, ignoring the pain thereby caused.

The nurse must understand that more harm is often caused by the injudicious use of a tourniquet than by the bite itself. It should be remembered that if left on too long a tourniquet will cause gangrene in a perfectly healthy limb, and that it will do so much more readily in one which is already damaged by snake venom. The tourniquet should therefore be loosened for two minutes every quarter of an hour, and not used for more than an hour altogether; by this time the poison will be largely used up in the tissues around the bite. Secondly, it should be remembered that, while the tourniquet is excellent for stopping the spread of the venom from the Viperine group, it is not so successful in stopping the progress of the Colubrine venom which spreads up the

nerves. Lastly, a tourniquet should never be applied tighter than is reasonably sufficient to control the blood circulation.

Anti-venene.—If the type of snake is known and the corresponding anti-venene is obtainable it should be injected at once in doses of about 100 c.c., given intravenously. Stocks of anti-venene for the snakes common to the district are usually kept in the larger stations.

General measures.—Stimulants, such as injections of strychnine, camphor or digitaline, may be required, and later morphia may be used to combat shock from the pain. Alcohol by mouth is a help, but should be used only in moderate amounts. Drenching the patient with alcohol internally is only adding a second poison to the first, not counteracting it. Injections of adrenalin are used for patients who are in danger of circulatory failure; it may be used hypodermically, intravenously or, in desperate cases, may be injected directly into the heart, a dose of 10 min. being given.

If deep coma is threatening, endeavour to keep the patient awake by slapping with wet towels and walking him about; but these measures should not be pushed to the point of exhaustion.

SPRUE

Sprue is a disease affecting not only the whole alimentary tract from the mouth to the anus, but also the patient's blood, mentality and general nutrition; manifesting itself in digestive disturbance, anæmia, irritability and emaciation.

The cause is unknown.

The distribution of the disease is peculiar, for while it is quite common in parts of India, China, Ceylon, and certain other countries, it is unknown in Africa. It is, however, a disease of the tropics, and affects

white people of both sexes who have lived some time in regions where the disease occurs, but is strangely uncommon in the natives. The illness may begin while the person is still living abroad, or long after he has left.

Clinical course.—Occasionally the disease begins suddenly; usually, however, the onset is gradual. The first symptoms are flatulence and a sense of abdominal discomfort after food, weariness, and a loss of weight. Next, occasional diarrhœa occurs, especially in the mornings; sore spots appear on the tongue, gums, or cheeks in about 50 per cent. of the cases. The stools from time to time become light-coloured—yellowish white—and the patient feels that his digestion is all wrong. These initial symptoms, in varying degrees of severity, may persist for months or years, and may be so slight or indefinite that, even if he seeks medical advice, the correct diagnosis is not suspected. Indeed, he may be treated for gastric trouble, appendicitis or dysentery, even for cancer, so vague and misleading can the symptoms be. Meanwhile, the disease is getting an ever stronger grip, until at last the appearance is typical of bad sprue. The body is greatly emaciated, the skin wrinkled and lifeless, the hair lustreless and tending to fall out. The tongue when affected is smooth, red and glazed, and may be ulcerated at the tip. There may also be painful ulcers between the gums and cheeks. The abdomen is distended and protuberant in the lower part, and the normal fat has disappeared from beneath the skin, which is thinned and reveals any muscular or intestinal movement.

On palpation, the abdomen has a peculiar doughy feeling.

The stools are numerous, bulky, and offensive; their colour and appearance are characteristic—yellowish-grey, frothy, liquid or semi-formed, containing undigested food. The urine is not altered. The patient

is anæmic, the red cell count may drop to one million or less; otherwise the circulatory system and pulse are not affected.

In a few patients the disease has little effect on the mind, but most are mentally altered and in some the change is very evident. Such patients are loquacious, especially about their own illness, cantankerous, peevish and impatient; even deceitful and mendacious.

At best the disease is tedious and the recovery slow, while often the course is extraordinarily chronic, and always there is a distressing tendency to relapse, a sudden return of the worst symptoms occurring when the patient has been progressing favourably.

Under treatment there should be a gain in weight, return of digestive power, and improvement in the blood-counts; in all respects, indeed, there should be a gradual return to the normal. The stools first become like soft white putty, then solidified and formed, and finally coloured and reduced to normal bulk.

Diagnosis.—The nurse need not greatly concern herself with diagnosis, as it is never one of immediate urgency and is properly the doctor's affair. Nevertheless, a clear account of the patient's temperament and deportment and the appearance of the stools, given by a nurse who has had experience of sprue, can be of the greatest assistance to the doctor. She must, however, be careful to give an accurate and fair account, not unduly over-emphasising this or that symptom or sign.

Prognosis.—The disease is serious at all times, but especially in the aged. If treated early and rigorously the chances of recovery are good; if treatment be delayed, a cure is difficult to obtain; while for patients who have been subject to relapses for years, the outlook is bad, as a permanent cure is problematical.

Treatment.—Many drugs have been tried in an attempt to cure this intractable disease, but the chief

thing is to restore the blood to normal by liver injections. In early cases a good recovery will soon follow, all other measures being subsidiary, though far from unimportant. They consist of (1) rest; (2) general care and nursing; and (3) dietary.

DRUGS.—One or other of the numerous extracts of *liver* are used orally or intramuscularly or both. *Nicotinic acid* tablets are useful when mouth symptoms are troublesome; the dose is 50 mgrm. *t.i.d.* *Castor oil* properly employed, in teaspoonful doses, is most beneficial. *Batavia powder*, a form of lime, is of use in checking the diarrhœa. It is given in cachets in drachm doses. *Kaolin*, a powder having a similar action, is also employed. *Salol* and other intestinal disinfectants are little use. *Calcium lactate* in 10-gr. doses is given, usually combined with *parathyroid extract*, given in tablets of $\frac{1}{10}$-gr. each. Though much has been claimed for the calcium-parathyroid treatment, it is far from receiving unanimous support from experienced doctors.

Iron and *arsenic* are used by some as intramuscular injections (p. 165); but I prefer arsenic by mouth and, indeed, recent compounds of iron can also be well tolerated by mouth.

Blood tranfusion is used in the severe anæmia, and has often proved of the greatest value (p. 158).

Vaccines are sometimes used.

REST.—Rest, as a part of the treatment, is very necessary, and during the preliminary part of the cure the rest must be absolute, the patient remaining in bed the whole time.

Such a state of affairs in a person suffering, let us say, with typhoid is understood and accepted by the patient, his friends and all concerned: not so, unfortunately, with sprue. The sprue patient feels able to be up and finds confinement to bed very irksome, and to his ill-advised pleadings for liberty may be added

the importunings of his friends. In such circumstances the nurse, in as tactful a manner as possible, will have to see the doctor's orders carried out. Occasionally, by special permission, the patient will be allowed to get up to a bedside commode; but in the absence of special instructions the nurse must regard the bed-pan as routine. The other exception to the bed rule is when the patient is helped out of bed, once weekly, to be weighed.

GENERAL NURSING.—When diarrhœa and flatulence are troublesome, a teaspoonful of castor oil will often work wonders, and soda-mint tablets, or a pinch of bicarbonate of soda, give relief from the flatulence.

As the diarrhœa decreases it may be replaced by constipation complicated by hæmorrhoids. This is best counteracted by petrolagar, glycerine suppositories and enemata. When the patient complains of general soreness of the bowel, 10 oz. of warm olive oil injected into the rectum very slowly, so that it may be retained, is beneficial.

Where bedside scales are available, the patient should be helped out of bed once weekly, at about the same hour, and weighed. This must be done most accurately, and the result immediately and accurately recorded, otherwise when the doctor comes along the nurse may find the patient flatly contradicting her statement. With tact, however, the weekly weighing can be made a matter of interesting discussion and speculation.

General massage is very useful and can be given about twice weekly.

There is no harm in a sprue patient having a plentiful supply of literature, except that for the very anæmic reading is too great a strain. Illustrated papers may be allowed.

The nurse should encourage the patient's confidence in his ultimate recovery and in his doctor and, without causing boredom, should surround the patient with a

cheery atmosphere. Few diseases will so well reward a display of nursing skill, combined with firmness and tact. Remember, a patient with sprue may often be led when he cannot be driven.

The skin.—In sprue the skin is dry and ill-nourished and thus liable to boils, eczema or bed-sores: now and then petechiæ (small hæmorrhages under the skin) may occur.

A blanket bath should be given daily, taking care to avoid chills, followed by the usual application of spirit and powder. Report any suspicious areas or rashes at once. A water-bed or air-cushions may be required, and the buttocks and sacrum should be protected from the bed-pan by a layer of wool. Constant attention must be given to the patient's hands and nails, washing being advisable after each motion.

The mouth.—Whether the mouth be sore or not, it must receive great care. Carious teeth will require dental attention. A mouth wash should be given after each feed, and the teeth should be gently cleaned night and morning. Dentures should not be worn while the mouth or tongue are sore. For the soreness, glycerin of borax is soothing.

The stools.—The appearance of the motions should be reported daily, and a stool saved when required for the doctor's inspection. After use the bed-pan must be removed at once; the atmosphere of the room, which becomes most offensive, can be sweetened by burning a piece of brown paper in the room, or sprinkling coffee-grounds on a hot shovel. Sudden bursts of fresh air from a widely-opened window, however, must not be tried.

If the stools have to be weighed, the simplest plan is to weigh the bed-pan before use, and again when it contains the stool, the difference being the weight of the stool, provided that no urine has been passed. Needless to say, special scales should be kept for this purpose; do not use the household food scales.

DIET.—There are nearly as many diets as there are doctors who have experience of treating sprue, the explanation of such diversity being that there is no one diet that will suit every case. Chronic sufferers may go from doctor to doctor, each one trying a different diet; each diet meeting with some success, each doctor experiencing the same disappointing failures to achieve permanent cure.

Most of the diets, however, have in common the administration of small quantities of nourishment at frequent intervals: therefore, if one diet is described in detail, it will serve the nurse as a model for regulating the amounts of food given in this or other diets, arranging them, of course, according to the doctor's instructions. If the doctor lays down clear instructions about diet, these must be followed to the letter, and if the nurse should find it difficult or impossible to do so, she must report the matter at once, and not take readjustment into her own hands. The diet can be a very sore subject with the patient, who may heartily dislike the class of food offered or cavil at its niggardly quantities, and the nurse will need all her tact to persuade him that the diet is the most suitable.

The food should be served with the utmost nicety, and punctually to the minute; soiled china or unfinished food should be promptly removed: in short, by her demeanour, talk and attention, the nurse should seek to stimulate the patient's psychical powers of digestion to the utmost. Furthermore, the patient should be enjoined to take his "feeds" slowly, if necessary sipping them with a teaspoon.

EXAMPLE OF DIET

8 *a.m.* ½ oz. lightly cooked minced loaf. One rusk. One teaspoonful of honey. ½ oz. orange juice.

11 *a.m.* 6 oz. of sprulac.[1]
1 *p.m.* 2 oz. minced loaf. One rusk. One over-ripe banana.
4 *p.m.* Cup of tea. One sponge finger. Teaspoonful of honey.
7 *p.m.* 5 oz. clear soup. 1 oz. steamed white fish. 2 oz. jelly.
Water may be sipped between meals.

This is given only to show the method of allocating the meals. Early in the treatment the diet might be more restricted and, as improvement in the symptoms occurs, it is gradually increased, but only as the doctor may direct.

Any appearance of relapse calls for drastic curtailment in the diet for at least 24 hours; the administration of a teaspoonful of castor oil will clear out any accumulation of fermenting material in the intestine.

Whatever diet is ordered, the nurse must obtain thereon the fullest possible instructions and see that they are carried out. Careful record must be kept of the amounts taken and also of the effect of any change of diet as indicated by the patient's comfort after food, and the appearance of the motions.

Prophylaxis.—As there is no satisfactory explanation of the cause of sprue there can be no certain knowledge about prevention. It appears likely that local conditions and dietetics have more to do with the origin of the disease than any definite germ; certain it is, however, that infection is not caught directly by contact or by nursing sprue patients, though nurses are just as liable as anyone to sprue if they live in a district where the disease is prevalent.

It is inadvisable for any one who has once contracted sprue to remain in the tropics, or to return there after treatment, and the earliest symptoms must be taken seriously.

[1] Sprulac is a special form of dried milk containing a high protein percentage. It is prepared by mixing an ounce of the powder with 8 ounces of water.

SUNSTROKE

Sunstroke is rarer than was at one time thought, but it unquestionably does occur, children being more susceptible than adults.

Cause.—The condition results from the action of the sun's rays on the brain and its membranes, when those rays are kept off by nothing more than the scalp and cranium. Probably the rays also take effect through the eyes. Negroes are not subject to sunstroke, partly because of their close hair, thick skulls and dark-coloured eyes.

Clinical condition.—The patient is suddenly overcome by giddiness and falls unconscious. Urine and fæces may be voided. As recovery takes place, the condition is akin to that of one recovering from concussion. He is restless or delirious, suffers intense headache and may vomit. The eyes are bloodshot and aching; photophobia is present. Sharp fever accompanies the attack and may pass into hyperpyrexia. The pulse is full and fairly rapid, though it may occasionally be slow and full, resembling the pulse of a patient with compression.

Recovery is heralded by a decrease in the severity of the symptoms; but the headaches, loss of power of concentration and intolerance of light persist for a long time, and may, indeed, be most intractable.

Complications.—Meningitis, lack of power of concentration, loss of memory, even dementia may follow, while recurring headaches are very common.

Diagnosis.—The diagnosis of sunstroke cannot be made with certainty when the symptoms appear, and should not be attempted, as sunstroke may be exactly simulated by cerebral malaria. Indeed, many deaths which would at one time have been attributed to sun

stroke are now known to be caused by subtertian malaria (cf. p. 92).

The correct procedure, therefore, is to leave the diagnosis open until a blood examination can be performed, and meanwhile to treat the patient for both sunstroke and cerebral malaria (cf. p. 92).

Occasionally other conditions, such as meningitis, may resemble sunstroke, but with these the doctor must deal and, in an emergency, the nurse will have done her best by following the advice given in the next paragraph.

Treatment.—Put the patient to bed between blankets with a hot bottle at his feet. Apply an ice-cap (p. 165) and sponge face, neck and shoulders with cold or iced water. If the temperature is high the whole body is sponged and afterwards briskly rubbed. Should hyperpyrexia develop, treatment as for heatstroke is adopted (*see* p. 65). Make a thin blood-smear lest the condition be one of cerebral malaria, and have the smear examined as soon as possible. Give at once an intramuscular injection of 5 grains of quinine. There is no time for microscopic examination of the blood before starting treatment for cerebral malaria, while, should the condition be truly one of sunstroke, the 5 gr. of quinine will have done no harm.

Encourage the patient to be quiet, and keep the room darkened and as free from noise as possible. Five grains of calomel may be given, to be followed in three hours by salts.

If the patient remains unconscious the doctor may order croton oil. This is given by mixing one minim with a little butter and placing it at the back of the tongue.

A very strong solution of ordinary salt may be given intravenously to relieve an intolerable headache, while for persistent headaches a subtemporal decompression is very efficacious. By this is meant opening the skull

to relieve the pressure and the œdema of the brain which has been caused by the sun's rays. For this operation a trephine, Gigli saws, a director and an elevator will be the special instruments required.

After an attack the patient should wear coloured glasses and avoid the direct rays of the sun, and in severe cases must leave the tropics until all symptoms have entirely gone.

Prophylaxis.—The use of a sun-helmet or adequately-lined umbrella during the sun hours of every day in the equatorial regions is essential (p. 6). Felt hats are scarcely sufficient protection. The fact that the sun is obscured by clouds or mist is no security, for the harmful rays may penetrate cloud in strength sufficient to cause sunstroke; ignorance of this fact has been the cause of not a few cases. Children especially must have their heads and necks well protected, and should never have the full force of the sun on their backs for any considerable period.

TRYPANOSOMIASIS

Trypanosomiasis is the name given to two types of disease, one of which can be acquired only in Africa, the other only in America.

The African disease begins with fever, and passes on to a state of drowsiness or "sleeping sickness," by which name the disease is popularly known.[1]

The African Type

The disease is caused by a small organism, the trypanosome, which can be seen through the microscope in a blood-smear from an infected person. Two varieties

[1] This disease has nothing whatever in common with *Encephalitis lethargica*, which, unfortunately, is sometimes called "sleepy sickness," or "sleeping sickness."

occur in Africa, *T. gambiense* and *T. rhodesiense*; infection with *T. rhodesiense* is the more serious.

INFECTION.—Man is infected through the bite of flies known as tsetse-flies. These are brown and about the size of small "blue-bottles." They bite fiercely in the heat of the day. Those which transmit the *T. gambiense* never live far from water, but infest the banks of streams and rivers, forming what are known as "fly belts." The flies themselves become infected from the blood of wild game in which trypanosomes abound without harm to their animal hosts.

Clinical course. *Onset.*—The disease begins some days or weeks after infection from the bite of a tsetse-fly. A feeling of malaise and headache form the initial symptoms, accompanied by low fever. Sometimes, however, the illness begins with acute symptoms including a high temperature, simulating an attack of malaria and, in districts in which malaria is rife, is at first almost inevitably mistaken for malaria. Repeated blood examinations, however, will reveal the trypanosomes, and the fever will be found to resist quinine.

Stage of fever.—In an untreated case the fever gradually increases, the patient feels more and more ill and shaky, the pulse-rate becomes rather rapid, and continues so even when the temperature remits. The spleen increases in size and the lymphatic glands enlarge, especially at the back of the neck—Winterbottom's sign. There may be some tenderness on deep pressure over the bones, or across the chest.

One of the aids to diagnosis is a very characteristic rash, for which search should be made daily. It is most obvious on the chest and back, but may be found on the abdomen or limbs. It appears as broad red rings of various sizes, or possibly as circular blotches, both forms fading on pressure. It may be striking or difficult to see. It is rarely, if ever, seen on native

skins. A hot bath may serve to bring out for a few minutes a rash otherwise invisible. When a patient is under observation the nurse must report the slightest suggestion of any rash.

This stage of fever may last for weeks or months and then gradually merge into the last phase.

Stage of sleeping sickness.—The patient now becomes more lethargic and inert, losing interest in his surroundings; the appetite diminishes and there is scarcely the energy to eat. True incontinence is not present, but the patient does not trouble to ask for a bed-pan or urinal, nor does it matter to him whether the bed be clean or soiled. Towards the end, convulsions or coma may lead to death; frequently the patient is carried off by some other disease.

Such is the course of an untreated patient and, until recently, treatment was of little avail to affect the result; now, however, with suitable treatment begun in time, there is a very fair prospect of complete cure.

Diagnosis.—The diagnosis is made by finding the trypanosomes in a blood-smear; both thick and thin methods are used (p. 154). Sometimes a lymphatic gland is punctured and the "juice" examined for the parasites. The nurse must remember that the syringe and needle used for this purpose must be dry. In doubtful cases some of the patient's blood is inoculated into a white rat, a creature very susceptible to the infection. Clinically the diagnosis rests upon the enlarged spleen and lymphatic glands, along with the rash and fever.

Treatment. *Medical.*—Many drugs are used, each having its special advantages and its drawbacks.

Tryparsamide, a white powder, is given intravenously. It is specially useful for late cases. It may cause atrophy of the optic nerve (*see* p. 135).

Antrypol ("Bayer 205") is likewise given intravenously, and is less toxic than tryparsamide.

Diamidino stilbene has recently proved very satisfactory, and can be given intravenously or intramuscularly in doses of 1 mgrm. per kilo. of body weight. It causes some temporary shock, but this quickly passes off. It is more particularly useful in the early stages.

Lumbar puncture is commonly used to control treatment or to relieve headache.

Nursing.—The patient must be kept in bed throughout the treatment when circumstances permit. In the stage of fever, sponging should be carried out as often as required. Plenty to drink and a low diet is desirable. Cold cloths to the head or an ice-cap (p. 165) alleviate the headaches.

In the stage of sleeping sickness, the nurse must remember that the patient is entirely dependent upon her for everything, and that it rests with her whether he is to be kept clean, comfortable and well-nourished, or the reverse. Much can be done towards keeping the bed clean by a little judicious attention and timely persuasion for, as already stated, the patient is not truly incontinent, only indifferent. All pressure points must be carefully guarded against bedsores. If convulsions are imminent, a padded spoon for the teeth should be kept ready.

When Bayer 205 is being used the patient's kidneys are affected and the nurse must test for and report albuminuria. Tryparsamide may affect the optic nerves, therefore the patient should be shielded from glare, and any complaint about vision reported at once.

Prophylaxis.—Protect the patient from further bites by tsetse-flies in order to prevent their becoming infected and spreading the disease. Known fly-belts should be avoided as far as possible, especially in the hotter parts of the day. When passing through these

areas every precaution should be taken against being bitten by wearing protective boots or puttees and a shade for the neck, and by exercising more than ordinary watchfulness. As a deterrent to the flies, the free use of Bamber oil is recommended; its composition is as follows: citronella oil, 1½ parts; kerosene, 1 part; coco-nut oil, 2 parts, and carbolic acid to make it of 1-per-cent. strength.

The American Form

Known also as Chagas' disease, this form is found only in parts of South America. It is caused by infection with *Trypanosoma cruzi*, and the trypanosomes are transmitted by the *Triatoma megista*, a variety of bug resembling a cockroach with red-striped markings. Other bugs may also play a part.

The illness takes two forms, acute and chronic.

The acute form.—This occurs in infants. There is fever with marked enlargement of the thyroid gland, general œdema and puffiness of the body. The child usually dies within a month with symptoms of meningitis.

The chronic form.—This occurs in older children and may cause thyroid, cardiac, or nervous trouble, according to the seat of the trypanosomes' activities.

Treatment.—No drugs have as yet been found which have any effect upon the trypanosomes, and little can be done for the sufferers beyond general nursing. See that the patient's clothes and belongings are sterilized or burned, and that the patient is freed from vermin (p. 117).

TYPHUS

Typhus has been associated throughout history with the insanitary conditions and lowered vitality consequent

upon war and famine, and the present conflict is proving no exception. As it is conveyed by lice, this is understandable, and it follows that the better the cleanliness and hygiene of a nation the less has it to fear an epidemic of this disease.

This is the true epidemic typhus, but there are many kindred diseases, such as flea-borne, tick-borne and mite-borne typhus; these are endemic in certain places rather than epidemic.

The illness takes the form of a severe continuous fever of about fourteen days' duration, accompanied by great toxæmia and prostration, and frequently ending in death.

Cause.—The cause is a small organism which is conveyed by the lice. As lice are active and crawl rapidly from one person to another, the disease is very contagious and can be conveyed even by chance contact; but the infection is not carried by the air, and the disease, therefore, is not infectious in the sense that measles and scarlatina are infectious. It can, however, only be nursed with impunity provided the patient be freed from vermin and the attendants are themselves free.

Clinical course.—There is an incubation period of one or two weeks; then for one or two days the patient feels ill and giddy; about the third day the temperature rises rapidly. The face and eyes become congested, the expression becomes dull and stupid. The mouth is very dry, the tongue brown and coated. A peculiar odour, as of mice or old clothes, is noticeable. The urine is scanty and highly coloured, and contains albumin; retention is not uncommon.

On the fifth day a rash appears on the flanks and abdomen and the inner side of the arms, and thence spreads to the chest and limbs. It has the appearance of a fine dusky mottling with, in addition, hyperæmic spots, which at first fade on pressure but later are

likely to change to small bright hæmorrhages under the skin, giving a mottled, blood-splashed appearance. A tourniquet applied to congest the arm may render the rash more visible.

As the disease progresses, the heart becomes weak and the pulse feeble. The patient is usually delirious. Constipation is present. Owing to the effect of the toxins on the blood-vessels, pressure is likely to cause bruising and bedsores. The blood shows a slight leucocytosis. Pneumonic complications are common, and pregnant women miscarry.

Diagnosis.—The diagnosis is fairly easy during an epidemic, but at other times may be very difficult.

An agglutination test can be carried out and the rash may be distinctive, but the doctor will have to rely largely upon the general clinical aspect of the patient and upon the nurse's reports, which must be made with great care, accuracy, and detail.

Treatment.—The patient should be removed from his surroundings, stripped, washed, and shaved of all hair and, when freed from lice (p. 117), put to bed lying flat between blankets. Pay great attention to the mouth, which becomes very foul; and from the outset guard against bedsores. Keep the bowels open by mild aperients, and measure the urine daily. Palpate the abdomen from time to time to ensure that the bladder has not become distended from retention. If there is retention apply hot foments or hot bottles to the lower abdomen; if retention persists, pass a catheter. Do not allow the bladder to become greatly distended. Sponge the patient frequently with tepid water; and in the daily blanket bath, as the patient is quite helpless, pay attention to the genitals; the parts should be carefully sponged, dried and powdered. Give large quantities of water to drink and maintain a fluid diet. Alcohol will probably be ordered as a stimulant. If vomiting

be present, give some bicarbonate of soda in the water. Should chest complications occur, raise the head of the bed, the patient being too weak for the sitting posture. Watch carefully lest sudden wild delirium occur. Have ready the lumbar-puncture needle in case the doctor wishes to use it for the relief of headache. An ice-bag may be ordered (p. 165), or cold sponging; also serum treatment.

Prophylaxis.—Typhus is conveyed by lice, and once an infected person's body becomes hot with the fever the lice become restless and steal forth to the outer garments, and thence will very readily pass to the garments of the attendants. Unless, therefore, the attendants are properly gowned and gloved to keep off the lice, infection is very likely. So at the earliest opportunity the patient must be freed from lice and the attendants' gowns changed and sterilized. The nurse should avoid getting any of the patient's blood on her skin.

ULCERS

In the tropics a nurse will encounter many and varied ulcers, usually severe ones. Their severity may be due to the virulence of the organism causing the lesion, but not uncommonly it is due to the lowered resistance of the patients, the result of too long a spell in the tropics, overwork, illness or other debilitating influence.

It will rest with the doctor to determine the actual cause of each ulcer and perhaps it may then be rapidly cured, but until then the nurse may have to treat the patient upon her own initiative.

In general, it is well to wash the ulcers with a strong solution of sterile saline (10 teaspoonfuls of common salt to the pint) and then apply frequent fomentations of lint which has been boiled in the same solution. After two or three days, substitute ordinary saline to which tincture of iodine (30 drops to the pint) has been added.

"Bipp" is also useful, but watch must be kept for bismuth poisoning—blue line on the gums, a dirty tongue and loss of appetite. Attention must be paid to the teeth and bowels, while endeavour should be made to improve the general health by rest and good food.

ULCERATING GRANULOMA

Ulcerating granuloma is a peculiar and severe form of ulceration which attacks the genital area.

The ulcer may grow very large, or more than one ulcer may be present. The perineum, pubes, lower abdomen, the inner part of the thighs and the genitalia are indiscriminately attacked by this spreading ulcer, which for long was considered incurable.

The disease is found scattered widely throughout the tropics and is a form of venereal disease. The causative organism is unknown.

Treatment.—Local treatment with fomentations, antiseptic lotions, ointments and powders is required. A prolonged course of intravenous injections of antimony tartrate will cure the disease, the injections being given every other day in doses of about 2½ gr., a total of 100 gr. or more being required for the cure.

UNDULANT FEVER

Undulant fever is a long-drawn-out illness, usually contracted by drinking infected milk, and most common in African coast towns and around the Mediterranean Sea; but it is by no means confined to those parts, having a very widespread distribution from tropical to temperate climates.

Because it was at one time a scourge of Malta, the disease is commonly known as *Malta fever*.

Cause.—The cause is a definite bacterium, the

Brucella melitensis which, like the typhoid bacillus, is taken into the system in contaminated food. The disease attacks cattle, especially goats, and the milk, butter and cheese from such infected animals are a source of infection.

Clinical course.—In its onset the disease closely resembles typhoid fever, from which it may be indistinguishable.

After an incubation period of about a fortnight it begins gradually with headaches, body pains, weakness, a general feeling of malaise and a slight rise in temperature. The feeling of illness increases, frequently a cough develops, the tongue becomes coated and the patient has little desire for food. Insomnia is common right from the beginning to the end of the illness.

The temperature gradually mounts up, with slight remissions in the evenings, at which times profuse sweats occur. At the height of the fever the patient may be somewhat delirious. The liver, and especially the spleen, become enlarged, and the lymphatic glands may also become swollen from time to time. Aching in the bones is felt and there may be severe pain in the lumbar region or in any joint, which will be inflamed and swollen. The inflammation is quite local and transient, and, after twenty-four hours, all symptoms and signs of trouble around the joint disappear, only to reappear then or later in some other joint. Such flitting joint pains are most striking and are characteristic of the disease, but they do not always appear.

Sometimes orchitis occurs, or neuralgia of various nerves may be troublesome. For about a week or ten days the symptoms increase in severity and the temperature rises; then improvement sets in and proceeds during the next week or ten days until the patient, although weak, feels nearly well and his temperature is approximately normal. A few days

later another bout of fever begins gradually, and wanes like the first attack.

These recurring waves of fever give the temperature chart a characteristic appearance from which the name "undulant fever" is derived.

In the mildest attacks the disease disappears after the first bout of fever and the patient recovers, while in the more severe forms considerable anæmia occurs and bouts of fever may recur for months, causing a very debilitating illness. Ultimate recovery, however, is the rule, the disease having a low mortality. In the few cases which are so severe that there is grave danger of death, various complications may occur.

Complications.—Endocarditis or pericarditis, phlebitis or arterial thrombosis, hæmaturia, melæna or epistaxis are sometimes encountered. The nurse should note, however, that in contrast to typhoid fever, epistaxis is a late rather than an early complication; further, melæna is in contrast to the brighter blood which comes from the bowel in hæmorrhage from a typhoid ulcer. Iritis and rarer complications also occur.

Treatment.—It will be well for the nurse to remember that the similarity between undulant and typhoid fever does not end with the onset of the disease, but that the nursing throughout is on very similar lines, except that the diet can be more liberal. Between the febrile bouts the diet, indeed, should be generous.

The patient should be in bed during the febrile periods at least, if not for the whole illness. On account of the sweats it is best to nurse between blankets, which must be changed frequently.

Sponge the patient assiduously if the temperature rises above 103° F.; at other times the usual morning and evening sponging suffices. Cold packs or ice sponging (p. 165) may be required if the temperature will not yield to simple sponging.

After the profuse sweats the patient should be dried with a warm towel, changed and made comfortable. The bowels, which are usually constipated (again in contrast to typhoid), can be kept open by laxatives, glycerin suppositories or enemata. As there is no ulceration of the bowel in undulant fever and therefore no risk of perforation, the restrictions which apply to purgatives in typhoid do not hold good.

Remember that the saliva, urine and stools are all infective and must be disinfected before disposal, and great care constantly exercised, as the disease is readily contracted by the nurse.

Diet during the bouts of fever should be restricted to milk, milky foods and jellies; but at other times may include chicken, fish, fruit and vegetables, in short, anything which is light and may tempt the patient to a nourishing meal. At all times large quantities of water or bland drinks must be supplied; towards the end of the illness the doctor will probably order some wine or spirits. The patient's utensils should be kept separate, and the usual precautions must be taken to ensure that the food of the other patients, or of the nurse herself, does not become contaminated, either through dust, flies, unclean vessels or the nurse's hands.

For painful joints antiphlogistine is an excellent application, as it does not require renewal. When this is not available, any form of hot fomentation or poultice is comforting.

The use of sleeping draughts requires discrimination, lest they form a drug habit (*see* p. 163).

Beyond treating symptoms as they arise, the doctor can do little to help the patient, except by vaccines, which sometimes shorten the illness. Sulphapyridine is sometimes useful.

YAWS

Yaws is a contagious disease confined to the tropics and characterized by fever, body pains and an eruption of nodules (yaws) and ulcers which appear in crops all over the body at regular intervals throughout a period of about a year. Although resembling syphilis, yaws is not a venereal disease. It is conveyed by contact, soiled clothes and flies.

The discharge from the sores is highly infective, and by contact can inoculate the infection into the least crack or cut in a person's skin. Native children are particularly afflicted with the disease. One attack confers immunity.

Distribution.—This disease occurs in most of the tropical countries, but is not found elsewhere. It is particularly common in the West Indies, the Federated Malay States and the Fiji Islands. Oddly enough, it is not common in China or India.

Prognosis.—Except in young children and in those attacked by a late lesion (gangosa), the disease is rarely fatal, and if treated early is readily cured.

Cause.—The cause is a minute organism, the *Treponema pertenue*, which closely resembles the *Treponema pallidum*, the organism of syphilis.

Clinical course.—Like syphilis, the disease has three stages—primary, secondary and tertiary.

Primary stage.—After an incubation period of about three weeks, the disease commences with headache, joint and body pains, and possibly sharp fever, vomiting and diarrhœa. These initial symptoms vary greatly and may be severe or practically absent. If at this time a careful search be made, one nodule, or a small group of nodules, will be found on the part of the body where the infection took place. This lesion is known as the "mother yaw." Towards the end of a week the initial

symptoms abate, but may flare up again one to three months later at the beginning of the secondary stage.

Secondary stage.—This stage begins, usually, before the mother yaw has healed, and is accompanied by a recurrence of the pains in the back, bones and joints, and by a fine scaly rash or peeling in circular patches over the body. In the midst of these patches yaws begin to form, singly or, more commonly, in groups. A yaw starts as a small pimple under the skin, and gradually enlarges until the skin cracks and a weeping sore forms. From time to time the secretion dries up into a yellowish scab, which crowns the nodule. Should the scab be knocked off, a raspberry-like granuloma is left, which may ulcerate, forming an ulcer an inch or more in diameter. The yaws are not painful or sensitive, but are itchy, and therefore cause scratching, with consequent secondary infection. They are very infectious, because their discharge teems with the infecting treponemes.

It takes several months for the yaws to clear up completely from an untreated patient, and the scars which are permanently left are usually pigmented.

Tertiary stage.—About three to six months later tertiary lesions make their appearance but, fortunately, only in a small proportion of infected patients. The lesions take the form of deep-seated bone destruction, which causes great deformity, or of deep-seated nodules, which lead to sloughing or ulceration of the overlying skin. There is a particular form of tertiary yaws which attacks the palate and was for some time thought to be a separate disease known as *gangosa*.

In this condition the palate and the bones of the nose are eaten away by an indescribably foul ulcer, allowing the nose and mouth to fall in, thus causing great unsightliness.

TREATMENT.—The disease is readily cured in the early stages by a short course of intravenous injections of

arsenical preparations, all the lesions healing up as if by magic, but relapses are not uncommon. An iodoform dusting-powder may be used as a dressing for the raw surfaces.

PROPHYLAXIS.—Ordinary cleanliness must be observed, and all cuts and scratches on the nurse's hands covered before any attempt is made to handle a patient or his clothes. Injections should be started as soon as possible, and all open yaws dusted and covered. Feeding utensils must be kept separate and boiled after use; and, of course, no patient with yaws should be allowed to handle food, clothing or other articles for the use of uninfected persons.

YELLOW FEVER

This disease once spelt death to many white people in the tropics. Now, thanks to preventive measures based upon knowledge of the manner in which yellow fever is spread, the disease is isolated to a few places, and even there the old-time epidemics are no longer a menace.

Cause.—The cause is an ultra-miscroscopic virus which is transmitted from one patient to another by the bite of a mosquito, *Stegomyia fasciata*, a variety that differs from the malarial mosquitoes in its habits, being more of a house-lover, living and breeding in and around human habitations. It is more generally known as the "tiger mosquito," on account of its peculiar markings. The eggs are laid in any available water, even in unused jugs or flower vases. The incubation period, from the time a person is bitten by an infected mosquito until the disease develops, is less than a week. An accidental infection can occur if a patient's blood comes in contact with the attendant's skin.

Clinical course.—The disease is usually described

in three stages: (1) the initial fever; (2) the period of calm; (3) the reaction.

The Initial Fever

Symptoms.—The patient is suddenly taken ill with shivering and pain all over the body, but more especially complains of intense frontal headache and backache. Soon he becomes feverish, restless, anxious and intensely miserable.

Appearance.—His face becomes congested, puffy and bloated. The eyes are bloodshot and look small and sunken, resembling those of a ferret. The tongue is small, pointed, and furred in the centre.

Temperature.—The temperature rises rapidly to 103°–104° F., and reaches its highest within thirty-six hours, after which it gradually falls to nearly normal. Such a temperature is typical, but great variations occur.

Pulse.—Starting full and strong at about 120, the pulse becomes weaker and slower, the alteration being very marked.

Urine.—The urine is acid, diminished in quantity, and very early in the disease contains large amount of albumin.

Period of Calm

When well established this stage is very definite but is frequently transient or even absent.

Symptoms.—The patient now feels better, and has relief from the intolerable headache. There is a feeling of lassitude and considerable thirst.

Appearance.—All the congestion vanishes, and by contrast the patient appears thin and pale. A slight yellow tinge may be noticed in the eyes.

Temperature.—The temperature has come down considerably and, if the attack be a mild one, may stay down, the patient making a steady recovery. In

a severe case the temperature, if it comes down at all, remains down only a short time.

Pulse.—The pulse is characteristic, becoming very soft and slow. The rate may drop to well below normal, and is unlikely to rise again even should the temperature do so.

Urine.—The urine is still scanty, and contains much albumin and a trace of bile.

Stage of Reaction

This occurs only in the more severe attacks, and is the dangerous period wherein the classical features of yellow fever develop.

Symptoms.—The patient is overwhelmed by the intensity of the toxæmia. The mind remains clear, but this condition may change at any time to a state of wild delirium. Insomnia is common. Vomiting is severe, and it may become the dreaded black vomit as a result of bleeding from the stomach. Diarrhœa may be present, and the motions may contain blood from the intestine. The gums bleed, and often the nose; while in women there is hæmorrhage from the uterus. In fact, in bad attacks, everything that can bleed does so, often to a considerable degree. Abortion or miscarriage in pregnant women is inevitable—and dangerous.

Appearance.—The patient has now the sunken hollow facies of extreme illness. There is increasing jaundice and there may be numerous subcutaneous hæmorrhages. With the vomiting, bleeding and prostration may come collapse, coma or death; or the condition may gradually improve and recovery follow a tedious convalescence.

Temperature.—With the reaction the temperature rises nearly to its initial height, and stays up for several days, terminates into a crisis, or may gradually come down in an irregular manner.

Pulse.—The pulse remains soft and slow throughout this period.

Urine.—The urine becomes very scanty, loaded with albumin and bile, and may contain blood from the kidneys. There is always the risk of suppression.

Mortality in Yellow Fever

Yellow fever is a serious disease, but the mortality varies greatly, some epidemics being mild, others having a mortality as high as 50 per cent.

The Nursing of Yellow-fever Patients

The bowels should be opened by a purgative early in the disease, and thereafter left alone lest intestinal hæmorrhage be started. Sternberg's mixture is often ordered; it contains sodium bicarbonate and mercury perchloride.

Nursing.—In the initial stages the nurse must try to relieve the patient's distress. Cold—or ice—sponging, if the temperature is very high, is soothing, and an ice-cap (p. 165) may relieve the headache. Placing the feet in a very hot mustard bath also relieves the congestion, while hot turpentine stupes or a mustard leaf to the loins or epigastrium may be required.

Drugs such as aspirin or phenacetin may be ordered, but must be used with discretion. Morphia is contra-indicated. From the very first the patient must be given plenty of water to drink; the more the better. It can be given cold, but not iced, during the first bout of fever; afterwards it should be hot. Barley-water or lemonade can be substituted, and bicarbonate of soda should be given in the fluids. The urine should be measured daily.

It is best to nurse the patient between blankets, and keep him recumbent until the doctor sanctions the sitting posture.

Diet is most important, and should consist, through-

out the disease and well into the convalescence, of fluids only. Milk or milky foods like Benger's, soups, liquefied jellies or beef tea are best, and very little should be given at a time.

Saline, given slowly per rectum, will do good if it be retained, and the nurse should have the intra-venous apparatus ready (p. 167) in case it is required by the doctor for giving 5-per-cent. glucose.

During the period of reaction the treatment should be stimulating, despite the hæmorrhages, and a little champagne or brandy can be given at short intervals if it does not cause vomiting. Should suppression of urine threaten, hot packs may be tried (*see* p. 163). Sometimes, if the patient is not perspiring freely, the doctor will order an injection of pilocarpin; it is best administered when the hot pack is beginning to act. In this way one achieves the maximum benefit with the minimum risk, and the perspiration is profuse.

When the patient is convalescent, the nurse must exercise the greatest care over the diet, as any indiscretion will precipitate a fatal relapse. No solid food should be given until ordered by the doctor, and then only in the most parsimonious quantities.

PROPHYLAXIS.—For the first week of the fever the patient must be carefully protected from mosquitoes, for new mosquitoes may become infected and spread the disease. The patient can be nursed with impunity, provided that care is taken to avoid getting any blood on the hands, and that day and night the attendants are absolutely protected from mosquitoes. A most determined war must be waged on these pests, and no uncovered water in which they can breed left anywhere near the house.

The only way to avoid yellow fever with certainty in an endemic district is to have a preventive inoculation. This gives almost certain immunity for at least two years.

SECTION III

TECHNIQUE

Baths

HOT. 100° F. or over.	TEPID. 70°–90° F.
WARM. 90°–100° F.	COLD. 70° F. or under.

For a **Mustard bath** mix two tablespoonfuls of mustard into a very thin paste with cold water and stir into a hot bath.

Blood Examination

Blood analysis enters so largely into the diagnosis and treatment of tropical diseases that the nurse will find her work more interesting if she makes herself familiar with some of the methods employed in examining the blood, and with the meaning of the results obtained.

Composition.—The blood is composed of about half fluid—the plasma, and half solid matter—the cells.

Serum.—When blood is withdrawn from the body and allowed to stand it clots or coagulates. The clot gradually shrinks and squeezes out a yellow fluid which is part of what originally constituted the plasma. This fluid which exudes from clotted blood is called serum, and corresponds to the whey exuded from junket. Many diseases such as diphtheria and bacillary dysentery, are treated by injections of serum. Each serum is obtained from the blood of a horse which has been specially inoculated with the corresponding disease germs and whose blood, therefore, has developed immunity or the power of neutralizing the toxins developed by the germs causing that particular disease. The patient's own powers of resistance are thus temporarily aided by the horse's serum in neutralizing the toxins of the disease. Thus, "serum treatment," which so often mystifies a nurse, is, in its essentials, very simple and intelligible.

Blood-cells.—The solid part of the blood is made up of minute cells or corpuscles which are of two main types: (1) red blood-cells (R.B.C.) or erythrocytes: (2) white blood-cells (W.B.C.) or leucocytes.

Red blood-cells.—In health the R.B.C. should number about 5,000,000 *in each millilitre of blood.* (*Note:* a millilitre of blood forms a drop about the size of a pin's head, and it is in this quantity that there should be 5,000,000 R.B.C.) It follows, therefore, that in the 8½ pints of blood in the average

human body there must be billions of R.B.C., and naturally the total is never actually reckoned out for practical work. It is sufficient to say, for purposes of a blood-count, that a person has so many R.B.C. per mil of blood, and the nurse must not be misled by this being referred to, as it often is, as the "total count" of the R.B.C.

The cells are counted under the microscope with a special pipette and slide known as a *hæmocytometer*, i.e. blood-cell measure.

Hæmoglobin.—Contained in each R.B.C. is a quantity of colouring matter called hæmoglobin (Hb.) and when each cell contains its normal amount there is said to be 100 per cent. of Hb. present.

The percentage of hæmoglobin in the blood is measured by means of instruments known as *hæmoglobinometers*.

Anæmia.—During illness of almost any kind the total count and Hb. percentage usually fall. A person with fewer than 5,000,000 R.B.C. per mil, or less than 100 per cent. Hb. is said to have anæmia or to be anæmic. Thus a moderate degree of anæmia would be represented by a R.B.C. count of 3,500,000 and an Hb. content of 75 per cent., while a count of 750,000 R.B.C. and 25 per cent. Hb. would show a severe anæmia.

The R.B.C. normally are small non-nucleated discs about $\frac{1}{7500}$ of an inch in diameter, but in ill-health these may vary in shape and size or may even contain nuclei. The following are some of the terms used to express these changes:

Poikilocytosis,	variation in shape.
Anisocytosis,	variation in size.
Basophilic,	staining blue.
Punctate basophilia,	stained with blue dots.
Erythrocyte,	normal R.B.C.
Megalocyte,	enlarged R.B.C.
Microcyte,	diminished R.B.C.
Normoblast,	normal-sized nucleated R.B.C.
Megaloblast,	enlarged nucleated R.B.C.
Microblast,	diminished nucleated R.B.C.

Note: No attempt need be made to memorize these terms; they are given merely for reference.

White blood-cells.—In health the W.B.C. number about 6,500 per mil of blood, although anything between 6,000 and 9,000 may be regarded as within normal limits. The W.B.C. are counted in the same way as R.B.C.

When the W.B.C. number more than 9,000 per mil, the patient is said to have a *leucocytosis*. Speaking in general terms, this is likely to occur in any septic infection and often indicates the presence of pus. For example, a leucocytosis is usual in peritonitis, appendicitis, pneumonia, tonsilitis, plague, relapsing fever, typhus and abscess-formation. In such diseases a high leucocytosis of perhaps 30,000 to 60,000 is often a good sign, showing that the patient's resistance to the infecting germs is good. It should be noted that certain important diseases, when uncomplicated, do not greatly alter the total W.B.C. count, e.g. tuberculosis, syphilis and malaria.

When the W.B.C. fall below 6,000 per mil, the patient is said to have a *leucopenia*. This condition is much less common than leucocytosis, occurring in comparatively few diseases, of which the more notable are uncomplicated typhoid, dengue and kala-azar.

Varieties of White Blood-cells

Up to the present we have considered the W.B.C. as a whole, but several varieties of leucocytes go to make up that whole. These varieties are recognized by their relative sizes and by the shape of each cell's centre portion or *nucleus*. In health, the relative proportions of the different white cells remain fairly constant, so that it is customary to state them as percentages. Thus the normal 6,500 leucocytes per mil of blood are normally composed of:

Polymorphonuclear cells (many-shaped nucleus) or "polymorphs"	65 to 70%
Lymphocytes (lymph cells) or "lymphs" . .	30 to 21%
Large mononuclear cells (single nucleus) or "large monos"	4 to 7%
Eosinophil cells (eosin-absorbing) or "eosins" .	1 to 2%

When the percentage of leucocytes is recorded, the result is known as a *differential count* as distinct from a *total count* which records the number of W.B.C. per mil. The differential count or percentage is obtained by counting a hundred leucocytes on a stained blood-film and classifying them under their proper names.

In disease, not only does the total number of W.B.C. vary, but the percentage of the different types of cells also varies. Thus in septic conditions the increase in the total number is due to the increase in the polymorphs, so that their percentage

rises—perhaps to over 90 per cent. In tuberculosis and syphilis the total number is not altered, but a differential count often shows the percentage of lymphocytes to have increased—perhaps to over 40 per cent. In malaria, the proportion of large "monos" may go up to 25 per cent., while in asthma and most worm infections the eosinophil percentage increases.

For purpose of illustration, five typical blood-counts are given, which should be carefully studied and compared with each other; the characteristic features of each are indicated:

	Normal	Malaria	Kala-azar	Liver abscess	*F. loa* infection
R.B.C.	5,000,000	**2,500,000**	3,500,000	4,250,000	4,800,000
Hæmoglobin	100 %	**40 %**	50 %	80 %	90 %
W.B.C.	7,000	6,000	**2,500**	**28,000**	8,000
Polymorphs	70 %	60 %	**43 %**	**89 %**	56 %
Lymphocytes	23 %	23 %	40 %	22 %	21 %
Large monos	5 %	**15 %**	**15 %**	7 %	3 %
Eosinophils	2 %	2 %	2 %	1 %	**20 %**
Parasites	nil	**B.T. Rings**	nil	nil	**Mf.loa**
Remarks		Punctate baso-philia	Aniso-cytosis		

From a study of the blood much help may be obtained towards diagnosing an illness, either by merely counting the cells; by finding parasites, as in malaria; by cultivating the blood germs or carrying out agglutination tests, as in typhoid and undulant fever; or by applying the Wassermann reaction (W.R.), or, as it is sometimes called, the Complement Deviation Test (C.D.T.), as in suspected syphilis.

Preparation required for a blood-count and blood-culture is given on p. 157.

To Make a Thin Blood-film

Required.—Two glass slides; one needle (a flat or triangular-pointed one is best); cotton-wool swabs; methylated spirits or ether.

Method.—1. Clean the slides; they must be quite free from grease, therefore always hold them by the edges so that the fingers do not come in contact with the flat surface. Before use, breathe gently on the slides, and polish them with a clean towel.

2. Clean the needle by plunging it a few times through a swab which has previously been wetted with the spirit.

3. Clean the tip of the patient's ring finger with the swab; and once this is done the patient must not let the finger rub against the hand or anything. Oddly enough, a patient is very inclined to rub the cleansed finger against the thumb.

4. Grasp the cleansed finger at the level of the last joint with the finger and thumb of your left hand. Squeeze tightly so as to compress the blood into the pulp of the finger, which should then be smartly pricked and held for a drop of blood to exude. If the prick is given quickly and while the finger is tightly held, it should pass almost unnoticed by the patient.

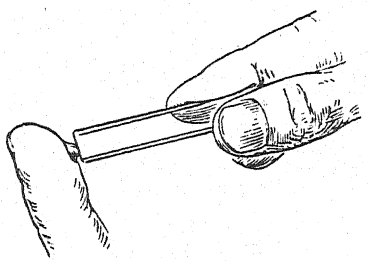


Fig. 10.—First stage in preparation of a thin blood-film.

5. Touch the drop with the end of one slide, then place this end on the other slide which should be lying on a flat surface (Figs. 10 and 11). The blood-drop will flow along the angle between the two slides. Now steadily push the end of the top slide along the surface of the other, maintaining the same angle. This should be done firmly, evenly and quickly, when the blood will spread out in a thin film on the bottom slide, giving its surface a ground-glass appearance (Fig. 12).

6. Now write the patient's name across the film with the point of the needle, which will scratch it finely on the smeared surface so that it cannot be accidentally rubbed off. There is nothing more careless or more annoying than slides becoming mixed through inefficient labelling. The slide dries in a minute or two and is then ready to be stained and examined. A duplicate film should always be made lest one be accidentally spoiled.

Special instruction would be necessary before a nurse could be expected to stain and examine slides, so no mention of this work need be made here; but it must be emphasised that every nurse abroad should be able to make blood-films with dispatch and assurance.

To Make a Thick Blood-film

Prepare and prick the patient's finger as for a thin-film (p. 155), and squeeze out a large drop of blood. Place a slide flat on this, give it a slight rotary movement to spread the

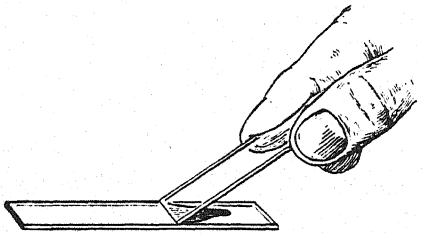


Fig. 11.—Second stage in preparation of a thin blood-film. (*Partly after Manson-Bahr.*)

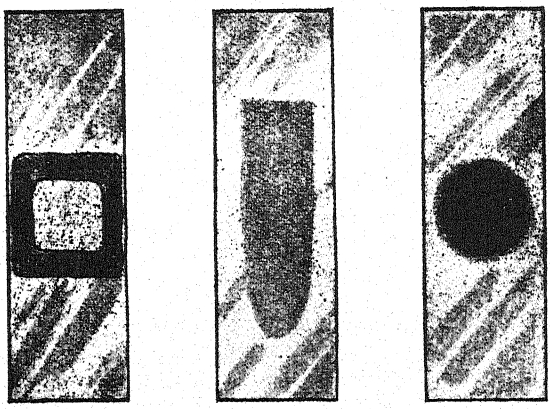


Fig. 12.—Blood-slides, illustrating wet drop, thin-film and thick-film. (*Partly after Manson-Bahr.*)

drop, lift off the slide and turn it over, wet side uppermost. Lay it flat under a fly-cover until quite dry (Fig. 12).

This method is useful for finding malarial parasites when they are scanty.

To Make a Covered Wet Drop

Prepare and prick the finger as before and make it exude a large drop of blood (p. 155). Just touch the drop with the flat of a slide, turn the slide over and place on the blood a clean cover-slip. Using vaseline, grease around the edges of the cover-slip to prevent evaporation. Lay the slide under cover in a cool place until required for examination. (Fig. 12.) This is useful for finding trypanosomes and microfilariæ.

Preparation for a Blood-count

Place on a tray and carry to the patient's bedside the following apparatus:

Cotton-wool swabs.
Slides and cover-slips, well-cleaned.
Vaseline.
Triangular, or flat-pointed needle.
Methylated spirit or ether.
Bottle containing fluid for diluting the R.B.C.
Bottle containing fluid for diluting the W.B.C.
Hæmocytometer.
Hæmoglobinometer.

Preparation for a Blood-culture

1. Clean the patient's skin at the bend of the elbow with ether, and swab over with 1-per-cent. picric acid in spirit or tincture of iodine. Cover with a sterile dressing and bandage.
2. Shortly before they will be required, boil in a covered receptacle one 10-c.c. syringe and two suitable needles; also two clean test-tubes. In a separate covered dish boil a pair of plain dissecting forceps. Do not lift either cover or add any cold water.
3. Provide a piece of rubber tubing and clip forceps to act as tourniquet; or, better, a blood-pressure apparatus.
4. Provide a sterile towel for the arm, sterile wool to plug the test-tubes, and a box of matches.
5. While the doctor is washing up, correctly apply the tourniquet (p. 166), remove the dressing, and apply more antiseptic. Remove the cover of the dish containing the forceps, but do not uncover the other dish until the doctor has picked up the forceps and is ready for the syringe.
6. When the doctor has finished apply a light dressing.

Blood Transfusion

Indications.—*Surgical:* before or after serious operations, severe hæmorrhage, septicæmia. *Medical:* severe secondary anæmia, e.g. sprue, blackwater fever, pernicious anæmia.

Blood groups.—According to certain properties which blood possesses, it is classified into four types or *groups*. A patient and a donor should belong to the same group, or the donor should belong to Group O, as the blood of this group is usually compatible with that of all the other groups. A Group O donor is therefore called a "universal donor."

In practice the group compatibility is usually checked by a direct test between the patient's blood and that of the suggested donor. This test depends upon the discovery that any serum which can destroy (hæmolyse) red blood-cells will first agglutinate them, i.e. clump them together; if, therefore, on testing by mixing the donor's blood with the patient's serum, aggutination occurs, the two bloods are not compatible.

The Donor.—The donor should be 20 to 40 years of age and should have suitable veins. There should be no history of syphilis, and the Wassermann reaction should be negative. There should be no malarial parasites in the blood, nor any history of malaria. There should be no other disease detectable, and the donor should be in good general health. The R.B.C. of the donor must not be agglutinated by the patient's serum.

The donor should eat a good meal two hours before being bled.

Technique

Blood transfusions are given in many ways, either from a donor or pooled blood. Again, only plasma may be obtainable, or desirable, and this may have to be reconstituted from dried plasma. The nurse will have to learn any special technique employed, but whatever it may be, one paramount need obtains —perfect asepsis throughout. Where special facilities are unobtainable, the method of giving citrated blood is convenient and this alone will be described.

Apparatus.—Two sterile flasks, each holding about 500 c.c., either graduated or marked at the levels of 80 c.c. and 330 c.c. (80 + 250).

Needles of different sizes, having a uniform bore from one end to the other; an expanded end (often provided for attaching a syringe) allows the blood to linger and so coagulate there.

Sterile 3·8-per-cent. solution of sodium citrate—about 200 c.c.

Some form of tourniquet; the best is the armlet of a blood-pressure apparatus.

A tube and funnel, with suitable connexion and needle, for giving the blood to the patient (Fig. 13, p. 167).

Method.—Suppose it is decided to withdraw 500 c.c. of blood, place in each flask 80 c.c. of the citrate solution.

Apply the armlet to congest the donor's arm, the pressure being slightly less than the blood-pressure.

Clean the skin over a suitable vein and arrange sterile towels.

Keep water at 110° F. in two basins into which the flasks containing the citrate solution can be placed to bring it to blood heat.

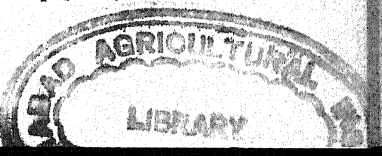
When the doctor inserts the needle into a vein, the blood will gush forth in a steady stream which the nurse should receive in one of the flasks, gently shaking it the while to ensure mixing the blood and citrate solution. When the mixture reaches the 330-c.c. mark, the second flask is substituted and similarly filled up to 300 c.c. Each flask will now contain 250 c.c. of blood mixed with 80 c.c. of a 3·8-per-cent. solution of sodium citrate, which works out at just under 1 per cent. of sodium citrate in each flask. (The object of using two flasks is to prevent the loss of all the blood withdrawn should any accident happen to either.) The blood is given to the patient in a manner exactly similar to that used for an intravenous saline injection (p. 166).

After treatment.—Cover the patient warmly and put a hot bottle to his feet. Record the pulse, respirations and temperature, and repeat these observations in half-an-hour (sooner if there are signs of distress). In all cases close watch must be maintained for at least an hour after the injection.

A severe rigor may follow, and hæmoglobinuria may appear, as if blackwater fever had been artificially produced. Such ill effects are usually transient, but may be fatal, and any sign of their onset must be at once reported to the doctor.

Give nothing but hot barley-water or plain hot water by mouth for four hours after the injection.

The donor should be allowed to rest quietly for twenty minutes or so, and should do no further work, mental or physical, for that day.



Bowel Lavage

There is frequent need for the nurse to give colonic irrigation in connection with tropical diseases, especially to patients with dysentery.

The nurse may be accustomed to passing the rectal tube well up into the bowel, under the impression that the irrigating fluid will thus proceed further along the colon and so wash it out the more efficiently.

This notion is mistaken and the result harmful.

The mistake can be demonstrated by the X-rays. A barium enema, given through a tube or nozzle which does not enter more than two inches into the rectum, can be seen to pass right round to the cæcum, so that to wash out the whole colon it is manifestly unnecessary to pass the tube further into the bowel. The X-rays, however, demonstrate even more than this; they show that a tube passed far into the bowel, the so-called "high rectal tube," very frequently kinks and curls back upon itself, and in reality a tube, of which perhaps some twelve inches have been passed into the bowel, may have advanced no more than six inches from the anus, and may be so kinked that the irrigating fluid will flow with difficulty, if at all.

The harm is done by forcing the tube against the mucous membrane lining the bowel for, however soft the tube, it is harder than the gut wall, which is consequently injured by the friction, and, if already weakened by ulceration, may be perforated.

Colonic lavage, therefore, does not necessitate a "high rectal tube," the use of which should be considered bad practice.

Cold Spray

The patient is stripped of all but a loin-cloth and laid on a mackintosh or mat, if possible in a draught or out-of-doors in the shade. Place blocks of ice in each axilla and between the thighs. Iced water, or water to which methylated spirit or whisky has been added (1 oz. to 1 pint) is then sprayed or sprinkled continuously over the patient from head to foot. At the same time an electric fan should be directed on to the patient, or a native set to fan him. Use a fine spray in order that evaporation, and consequently cooling, may be the more rapid.

Take the temperature in the rectum from time to time; when it drops to 102° F. stop the spray. Dry the patient, put him to bed between blankets, and keep careful watch on the pulse and temperature.

The cold spray is used for any form of hyperpyrexia, but especially for sunstroke, the object being to cool the patient as quickly as possible.

Disinfection of Stools and Urine

In all bowel diseases great care should be taken to disinfect the stools before they are thrown away. Any good liquid disinfectant will serve, but even the best fail if wrongly used. The disinfecting solution must be well stirred into the stool so that any lumps of material are broken up. The mixture should then be covered and set aside for an hour or so to give the disinfectant time to take effect.

When the urine is likely to be infective in any illness it should be treated with disinfectant and allowed to stand before being thrown out.

Disposal of the Dead

In this connexion it may happen that the nurse has to make the necessary local arrangements.

Putrefaction in the tropics proceeds with astonishing rapidity; therefore whatever has to be done must be done quickly.

Fractional Test-meal

A fractional test-meal is the method the doctor adopts to test the chemical properties of the gastric juice, the time required for the patient's stomach to empty, and other phenomena, such as the presence of blood, bile, etc. It is a useful aid to diagnosis in certain gastric conditions.

Preparation of the meal.—Two tablespoonfuls of fine oatmeal are stirred into two pints of cold water, brought to the boil and allowed to boil gently with frequent stirring until the quantity is reduced to one pint. Strain through muslin and add salt to taste.

To pass the tube.—A special tube is employed, having at one end a small perforated oval bulb. At certain distances towards the other end, black rings are marked on the tube to indicate how far the bulb has passed after being swallowed. Before use the tube is sterilized by boiling.

The test is carried out in the morning before the patient has had food or drink. The patient should sit up, and the nurse

should reassure him that swallowing the tube causes nothing more than a feeling of discomfort or choking as if a crumb had "gone the wrong way." Clear instructions should be given that, when the choking feeling starts, the patient must concentrate on taking three or four deep breaths rather than on trying to swallow the tube, by which expedient the bulb will pass the larynx, and can be further swallowed with but little difficulty. These instructions being understood, the patient is allowed to swallow the tube, which is gently and gradually passed into the mouth as required. No alarm need arise at any spluttering and choking. Calm insistence on the patient breathing steadily and deeply is the secret of success, and most patients will swallow the tube without much difficulty.

The tube is permitted to go down until the two-ringed mark has just passed the patient's teeth, when the bulb will be safely in the stomach.

To prevent the tube being swallowed too far, the free end should then be secured by a pair of forceps.

Method of test.—The tube having been swallowed satisfactorily, the nurse attaches a 10-c.c. syringe to the free end and gently withdraws all the gastric juice that is present in the stomach. This fluid varies greatly in quantity; usually from 20 to 200 c.c. may be withdrawn. It is put into a specimen glass, covered with gauze and kept in a cool place until the test is completed.

The end of the tube is now clipped, and the gruel is given to the patient to swallow. It will be found that the tube is no hindrance to taking the gruel, which should all be swallowed.

Note the time at which the meal is finished. Now give the patient something interesting to do or read, and tell him to disregard the tube altogether; it must not be withdrawn until the test is finished. No further food or drink must be given.

Half-an-hour after the gruel, 5 c.c. of the stomach contents are drawn up through the tube by the syringe, and put into a test tube labelled "½-hour." The mouth of the tube must be plugged with wool. Now, using the syringe as a pump, 2 or 3 c.c. of air are blown down the tube to clear it. This procedure is carried out after each sample is taken and at any time that the tube should happen to become blocked. Similar samples are withdrawn at intervals of 15 minutes until there is no trace of the gruel to be seen. This will take some three to four hours. A separate test tube is used for each sample, and clearly marked with the time which has elapsed between the end of the meal and the taking of the sample; the series of test tubes therefore should read ½, ¾, 1, 1¼, 1¾ hours, and so on.

The syringe should be carefully washed out each time after use, otherwise the test may be rendered inaccurate. During the test the nurse may be required to give an injection of histamine. This should cause an increase in the gastric acid flow.

To withdraw the tube.—When the test is completed the tube is gently pulled out of the patient's mouth until it seems to catch a little: gentle traction is then maintained and the patient told to swallow once, when the tube will come out without trouble.

The patient is now given a mouth-wash, after which he can have his ordinary food, as he is likely to be ravenous. After removal, the tube must be very carefully cleaned, and then boiled. The fasting-juice, together with the sample tubes, should be given to the doctor immediately after the test is completed, or sent to the laboratory, according to instructions.

Hot Pack

An assistant should be obtained if possible, as it is difficult to give a hot pack single-handed.

A large mackintosh covered with a blanket is placed beneath the patient and his bed-gown removed. A blanket is wrung out of hot water (180° F.) at the bedside and quickly rolled round the patient as hot as it can be borne. This is at once enveloped in the under blanket and tucked well around the patient. Hot-water bottles are placed outside this and more blankets piled on top. Lastly, the patient is given a copious draught of weak tea or lemonade, as hot as it can be taken.

Perspiration should start in a few minutes, and, if an injection of pilocarpin to increase perspiration has been ordered, now is the time to give it. Take the pulse at the temple from time to time, and watch the patient carefully for the half-hour or so that he has to remain in the pack.

When time is up, or upon any sign of collapse, the pack should be removed, and the patient rapidly dried with hot towels and made comfortable in a warmed bed-gown and blankets, with a hot bottle at his feet.

The hot pack is applicable for suppression of urine, the object being to stimulate the patient and induce free perspiration.

Hypnotics and Analgesics

Mention is made of a few of the drugs commonly used for inducing sleep or giving respite from pain because in using them the nurse will often have to rely upon her own knowledge and

discretion. The selection of the correct drug for a given patient may prove as beneficial as a wrong selection may prove dangerous.

There are few sedative drugs to which the dangers of habit formation are not attached; the jaded system of an invalid once soothed by a drug only too eagerly welcomes further doses, without thought of harm, until a craving has become established and the will undermined. Notorious in this respect are opium and its derivatives, and also veronal and trional. At no time, without the express instructions of the doctor, should a nurse continuously administer a habit-forming drug.

Allonal.—This is a moderately safe drug which in doses of 1–2 tablets induces a refreshing sleep, and in doses of 2–4 tablets relieves moderate degrees of pain, such as headaches and menstrual discomfort. Not more than four tablets should be given in twenty-four hours.

Aspirin.—The efficacy of this drug, akin to the salicylates, is well known, but it is seldom realised that doses of 5–10 gr. are, for most purposes, as useful as the ridiculously and dangerously large amounts frequently consumed. The tablets should be crushed before being swallowed.

Bromides.—This group is one of the safest sedatives, especially for cerebral excitement. Potassium bromide in doses of 30 gr. or its equivalent, can be given three times daily, or double this amount may be given as a single dose in bad cases. A severe pustular rash may follow the use of bromides, and their administration must then cease.

Chloral hydrate.—This is purely a hypnotic and is useful for patients with cerebral excitement, but it is a cardiac depressant and must be used with caution. Dose, 5–15 gr.

Phenobarbitone.—An efficacious hypnotic and sedative, useful for controlling epileptic fits. Dose 1–5 gr.

Medinal.—Similar in effect to phenobarbitone. Dose, 5–15 gr. Should be given not less than one hour after food.

Morphia.—Good for relieving severe pain and surgical shock and in cardiac failure. Contra-indicated for cerebral excitement. Dose, $\frac{1}{6}$–$\frac{1}{2}$ gr.

Paraldehyde.—One of the safest hypnotics, but of objectionable taste. Useful in pneumonic conditions. Dose $\frac{1}{2}$–2 drachms.

Phenacetin.—This is similar in action to aspirin and is useful for mild pain, especially when combined with caffein. Dose, 5–15 gr.

Pyramidon.—This is similar to antipyrine and is frequently given combined with phenacetin and caffein for headaches. Dose, 5–15 gr.

Sedobrol.—A pleasant form of bromide, one cube containing

about 17 gr. Dissolved in hot water it forms a pleasant drink.

Trional.—Officially known as methysulphonal, this acts similarly to veronal. Dose, 10–20 gr.

Veramon.—Useful for relieving moderate degrees of pain, such as neuralgic or uterine pain. Dose, 6–12 gr.

Veronal.—Officially known as barbitone, this is a simple hypnotic, its greatest objection being the risk of habit formation. Dose, 5–10 gr.

Ice-Cap

In the absence of a proper rubber cap, an ice-cap can be improvised by breaking up ice into small pieces, mixing it with salt and sawdust and tying it up in lint or a piece of mackintosh sheeting. Strictly speaking, the head should be shaved before applying an ice-cap, but this is not always desirable. When a proper ice-cap is in use, take care that the washer does not get lost.

Ice Sponging

In its application and effects ice sponging is very similar to the cold spray.

The patient is laid on a mackintosh or mat. Ice is tucked into each axilla and between the thighs. With a small towel in her hand to prevent slipping, the nurse grasps a suitable block of ice and rubs it all over the patient's trunk and limbs in long sweeping strokes. This is continued until the temperature in the mouth or rectum has fallen to 102° F., when the patient is dried, put to bed between blankets, and carefully watched.

Intramuscular Injection

Verify the injection, fill the syringe, affix a needle (about size No. 12 is suitable), and expel the air.

Prepare the buttock with spirit and iodine. The injection is best made about 5 in. from the middle line of the body and 2 in. below the iliac crest. With the forefinger and thumb of the left hand stretch the skin flat and tight at this place, and then with the needle affixed to the syringe in the right hand, make a sudden bold stab, which should be sufficient to carry the point of the needle through the skin and superficial tissues, well into the gluteal muscle.

The stab should be made from a distance of 3 or 4 in., this being much less painful than if the point of the needle be placed against the skin and then inserted.

The injection is given slowly, and the needle removed with one sharp pull.

The puncture is sealed with collodion and the place gently massaged to assist absorption.

Quinine injections usually cause pain and tenderness, but other drugs are mostly painless.

Intravenous Injection

Syringe method.—This method is used for giving various drugs.

1. Check the drug and dose with those ordered.

2. Roll up the patient's sleeve and apply a tourniquet to the upper arm. The tourniquet should be so fixed that it can be easily and quickly undone; a piece of rubber tubing and a pair of Spencer Wells forceps are convenient, but the best method is to use the armlet of a blood-pressure apparatus. The tourniquet should be tightened up to a point nearly, but not quite, sufficient to stop the radial pulse. This will allow the arterial blood to enter the arm but will stop the venous return, so causing the congested veins to stand out clearly and firmly. A tourniquet applied properly makes easy an injection otherwise difficult or impossible.

3. Clean the skin at the bend of the elbow with ether and apply iodine tincture; then arrange a towel under the arm.

4. Fill the syringe, which must have been freshly sterilized. Then affix a sharp sterile needle, about size No. 12.

5. Hold the syringe and needle vertically upwards and expel any air.

6. Select a prominent vein and, with the patient holding his elbow straight and the fist clenched, push the needle through the skin over the vein; then push it on into the vein. Thus there are two movements of the needle: first, through the skin, second, through the vein wall. This done, withdraw the piston slightly to make sure, from blood flowing into the syringe, that the point of the needle is inside the vein. If this is correct, hold the syringe steady and loosen the tourniquet, then very slowly press the piston home. If a swelling forms, or the patient complains of pain, the needle is not rightly placed and the injection should be stopped. If by accident some of the solution has got into the tissues around the vein and is causing pain, apply a fomentation and report the matter to the doctor. Never try to conceal this accident, for severe inflammation and necrosis of the skin may ensue.

When the injection has been made, gently withdraw the needle,

elevate the arm and wipe it with a sterile swab; touch the puncture with tincture of iodine and apply a light sterile pad.

Tube-and-funnel method.—This method is used when it is necessary to give large quantities of fluids, as in a saline injection, and the nurse is more likely to be required to assist the doctor than to have to give an injection. She must, however, exercise the greatest care to see that all is correct, for the slightest error or carelessness may lead to serious trouble.

The apparatus (Fig. 13), even if thought to be in perfect order, must be tested just before it is sterilized, and it should be sterilized only shortly before it is likely to be required.

When inspecting the apparatus, the nurse, personally, should give particular attention to the following points: see (1) that the funnel is not cracked; (2) that the rubber tubing is not perished or punctured or split; (3) that the tubing is tightly secured by narrow tape at all junctions: thread is likely to cut the tubing during the boiling; (4) that the clip works and is open; (5) that the needles are sharp and have in them stylettes which can be easily withdrawn; and (6) that the needles fit properly to the tube nozzle.

Only by this method of detailed inspection can efficiency be guaranteed, and, unless a fault be reported beforehand, no excuse need be offered by the nurse should the apparatus fail to work when required.

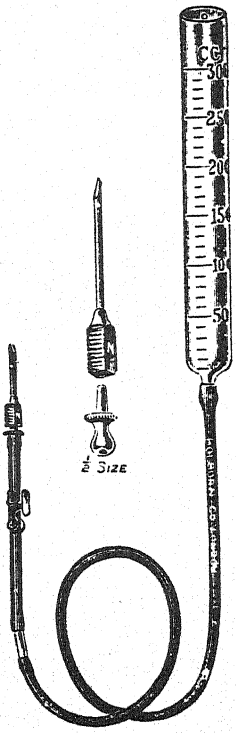


Fig. 13.—Apparatus for intravenous injection, with regulating clip on tube, and special form of needle.

After inspection, the funnel is rolled in lint, and, with the exception of the needles, the complete apparatus is placed in cold water, brought slowly to the boil, and boiled for ten minutes. The needles are kept in spirit and lysol and rinsed out in boiling water immediately before use.

Take note that the clip on the tube must be open when the apparatus is being boiled.

Giving the injection.—The solution for injection is first checked, and then the flask containing it is set in a basin containing hot water to bring the injection fluid to the right temperature; this temperature is reached when the outside of the flask is uncomfortably hot to the hand, as considerable heat is lost when the fluid is passing through the funnel and tube.

With the patient in bed, the tourniquet is applied and the arm prepared as previously detailed.

Boiling water should be available to renew the water in the basin as it cools, taking care that the water put into the basin is not sufficient to upset the flask. As the flask becomes empty, however, it will become necessary to hold it steady, or else to arrange it so that its mouth cannot dip into the water in the basin.

When at the right heat, a little of the injection fluid is poured into the funnel, which is so manipulated that all the air is driven out of the tube by the solution; the clip should now be closed. The detached needle is next inserted into the vein and, if blood flows out at once, the tube nozzle is applied, the tourniquet is loosened, the clip is opened, and the injection is allowed to flow slowly and steadily into the vein from the funnel, which is held 2–3 feet above the arm and replenished as required from the warm flask.

Towards the end, take care that no drops from the outside of the flask run down the neck into the funnel. When the injection is finished, a dressing is applied to the arm, and hot bottles given if the patient feels or complains of cold.

Protein-Shock

In chronic diseases this method of treatment sometimes produces surprising and gratifying results.

By an intravenous injection of some form of protein, usually an enteric vaccine, the doctor deliberately induces one or more rigors in the patient. A rigor of this nature is often severe, the temperature mounting to 103° F. or higher. Soon, however, this subsides, and the patient is none the worse, while there is every hope that the application of this sudden goad may incite the tired system to a victorious combat with the chronic infection, thus freeing the patient from his old complaint.

Train Journey

It may be necessary to take a patient upon a long railway journey. Before starting, arrange to have a proper supply of

rugs, air-pillows, etc. A bed-pan and urinal may be necessary, and it is advisable always to have catheters and some means whereby they can be boiled. Tinned milk in sufficient quantity should be provided, likewise soda-water; do not buy native soda *en route*.

A nurse's kit should be as compact as possible, her instruments clean and her dressing-case ready, so that she can pack up and set out on her work at a moment's notice. The maternity kit, especially, should be frequently overhauled to see that it is in good order.

A nurse providing herself with a new kit will do well to buy all her instruments of stainless steel; it is rather more expensive, but will save money in the end.

Turpentine Stupe

Sprinkle a few drops of turpentine on a piece of flannel or lint of such size that when folded in four it will nicely cover the place affected. Roll the flannel in a wringer and dip into boiling water for a couple of minutes. Then wring out and apply the flannel to the part and cover it with cotton-wool or a few layers of thick brown paper. The stupe should be removed in fifteen minutes or when the patient complains of the tingling.

SECTION IV

CARE OF THE EYES

EYE affections may be encountered in the tropics when medical aid is not immediately available; therefore an elementary knowledge of the conditions likely to arise and the way in which to treat them will often prove a very useful asset to the nurse. For details, a suitable work on the subject must be consulted.

GENERAL NOTES ON TREATMENT

Antiseptics.—These are usually best avoided. Aseptic methods should be preferred and will generally prove more efficacious. The secret of success lies in prevention of infection, and for this purpose cleanliness and irrigation with normal saline are of service. When antiseptics are used, boric-acid lotion, 10 gr. to the ounce, is useful. So, too, is argyrol used as a 10-per-cent solution, but this should be washed away with saline a couple of minutes after application. Argyrol must not be used continuously for more than two weeks lest the eye be damaged or discoloured.

Drugs.—*Atropine*, in a 1-per-cent. solution instilled (dropped) into the eye, dilates the pupil and gives the eye rest. It is useful in iritis. *Homatropine* has the same but a less prolonged action. When influenced by these drugs the vision is hazy, and no attempt to read should be permitted. Atropine poisoning is demonstrated by dryness of the throat and mouth. As a 1-per-cent. ointment atropine is less likely to cause poisoning. These drugs should never be used unless prescribed by a doctor, because in glaucoma their employment is disastrous.

Cocaine is used as a local anæsthetic and to relieve pain, e.g. in burns, in the form of a 5-per-cent. solution instilled into the eye every few minutes until the required effect is obtained. As cocaine dries the eye, the lids must be kept closed.

Dionin, applied as a 3·5-per-cent. solution, flushes out the eye by increasing the flow of lymph.

Eserine contracts the pupil and is antagonistic to atropine. It is used in glaucoma, 1·5 gr. to the ounce. The solution turns reddish when old and should be freshly prepared.

Fluorescin in a 2½-per-cent. solution shows up corneal ulcers, which are stained green, the normal tissues remaining unstained. *Acriflavine* is used for the same purpose.

Remedial Measures

Application of heat is useful to relieve pain. Hot fomentations frequently changed, or bathing the eye with water as hot as can be borne, are suitable. After using fomentations, hot dry cotton-wool should be applied. *Dry heat*, using flannel or similar material, prevents the lids from becoming sodden.

Cupping.—A little methylated spirit is poured into a wine-glass and rinsed round, emptying out superfluous spirit and wiping dry the outside of the glass. A match is then applied to the spirit remaining in the glass and, while still flaming, the mouth of the glass is firmly pressed upon the temple, which should previously have been vaselined.

Irrigation is used before operations and in inflammatory conditions. It is easily applied by the "pledget of cotton-wool" method. The patient, lying on his back, must look upwards; a pledget of wool is soaked in the irrigating solution—usually normal saline at 90° F.—and the liquid gently dripped into the eye.

Application of ointments.—With the patient looking upwards, the lower lid is everted and the ointment gently placed on it with a sterile glass rod.

Eversion of upper lid.—This may be necessary for removing foreign bodies or painting the lid. It is accomplished by seizing the edge of the lid, including the lashes, between the finger and thumb, instructing the patient to look downwards, pulling the lid away from the eyeball and, with a match, pressing gently downwards upon the upper part of the lid. With practice the match becomes unnecessary.

The Eye in the Tropics

A dry spell and the prevalence of flies are both sources of danger to the eyes. It is necessary, therefore, in any severe illness to protect the eyes by keeping them closed as much as possible. This especially applies to smallpox. Irrigation and the application of "boro-vaselin" ointment help to prevent complications and give comfort. Any complications must be treated on general principles.

Glare causes a group of symptoms on continued exposure to the tropical sun. It commences as discomfort, passing into pain. Prevention requires glasses made of tinted or, better, of "Crookes's A" glass; the "B" glass is for those who are susceptible to glare. Glasses or goggles should have non-rusting metal frames.

Injuries.—*Burns* and similar injuries require prompt treatment. If caused by acid, irrigate with 1-per-cent. soda solution; if caused by alkali, irrigate with saline. Apply cocaine for pain, and always instil castor, olive, or cod-liver oil.

Mosquito bites near the eye may cause swelling or severe inflammation. Fomentations are indicated. An *ant* may get into the eye and bite severely; its removal, which may necessitate everting a lid, is essential. *Flying insects* often impinge on the eye while motoring; therefore glasses or goggles should be worn, especially at night. *Houseflies* may carry infection from neighbouring filth; the eyes of babies and helpless patients therefore should be protected by netting.

Styes are common in the tropics. Hot fomentations give relief. Styes may be prevented by attention to the bowels and general health, and washing the lids nightly with sodium-bicarbonate solution, then applying dilute ammoniated mercury ointment.

Conjunctivitis causes a feeling of burning in the eye with irritation, redness and sticking of the lids in the mornings. Unless treated, it may become purulent. It should be considered infectious and care taken not to transfer the infection to another patient or to oneself. Cleanliness always, with saline irrigations frequently, and argyrol instillations night and morning are indicated. A simple ointment may be applied last thing at night.

Epidemic ophthalmia is a special form of conjunctivitis occurring as an epidemic at certain seasons, usually when "eye-flies" (sandflies) and houseflies are worst. Treatment is the same as for conjunctivitis.

Corneal ulcers.—An ulcer is frequently invisible until shown up by fluorescin. Treatment requires foments, and, if ordered, atropin.

Glaucoma is a painful condition of the eye which may come on suddenly, though it is sometimes foreshadowed by headaches and misty vision towards evening, objects appearing as if seen through steamed glasses. The disease is more common in the elderly and the short-sighted, and results from blockage of the channels which drain the aqueous fluid away from the eyeball. The eye, therefore, becomes distended with fluid under high pressure, which arouses the most intense pain and rapidly destroys the optic nerve, causing permanent blindness of the affected eye. Vomiting is frequent, and upon occasion may be so prominent as to cause a diagnosis of some abdominal complaint. Local treatment consists of cupping or application of leeches, together with the instillation of eserine to contract the pupil and so draw the iris away from the periphery of the eyeball where the drainage system is situate, thus leaving all possible room for the fluid

to escape. General treatment consists of a full dose of salts, repeated if necessary, and an injection of morphia to relieve the pain; as much as half-a-grain may be ordered. The patient should be in bed.

Iritis is inflammation of the coloured part of the eye (iris). The colour is lost and movement of the pupil becomes slow. Radiating redness occurs around the margin of the cornea. The disease is usually painful. It is treated with atropin and bathing with hot boric lotion. Attention should be paid to the bowels.

SECTION V

GLOSSARY

TERMS EMPLOYED

Alimentary canal—the channel through which food passes from the mouth to the anus.
Alkaloid—the active organic base of a drug.
Anæsthesia—loss of sensation.
Anorexia—without appetite.
Anuria—absence of urine.
Apyrexia—without fever.
Ascites—fluid in the peritoneal cavity.
Atrophy—wasting of a part.
Axillæ—the armpits.

Bacillus—any rod-shaped bacterium.
Bland—harmless; soft; non-irritating.
Bokar—fever.

Cachectic—ill-nourished and toxic.
Cæcum—large bowel in right iliac fossa.
Cancrum oris—gangrene of the mouth.
Carrier—any person not himself ill but capable of infecting others.
Chyle—the fatty milk-like fluid absorbed by the lymphatics from the small intestine during indigestion.
Cirrhosis—hardening from increased fibrous tissue.
Clinical—bedside; to do with a sick person.
Colon—large bowel down to rectum.
Corpuscle—blood-cell.
Cyst—an abnormal cavity containing fluid; a resistant or protective form of amœbic parasites.

Debilitating—weakening; lowering.
Dropsy—an effusion of fluid into the tissues and body cavities.
Dysuria—painful micturition.

Emaciated—wasted; thinned.
Emaciation—wasting; a loss of flesh.
Embryo—the undeveloped young.
Encysted—formed into a cyst.
Endemic—constantly present in a district.
Enemata—plural of enema.
Eosin—a red dye.

Eosinophil—a white blood-cell which is readily stained with eosin.
Epidemic—any illness affecting many people at the same time.
Epidermic—belonging to the skin surface.
Epigastrium—the pit of the abdomen.
Epistaxis—nose-bleeding.
Erythematous—reddish.
Excoriated—scratched.
Extravasation—out-pouring of fluid into the tissues.

Facies—facial expression.
Fæces—stool; motion; material from the bowel.
Febrile—feverish.
Fistula—a septic track leading from one surface to another.
Fulminating—sudden; like a thunder-clap.

Glucose—the sugar most easily utilized by the body for nourishment.
Glutinous—sticky; viscid.
Granuloma—an inflammatory mass of tissue.

Hæmaturia—passage of blood in the urine.
Hæmoglobinuria—urine containing the blood pigment hæmoglobin.
Hæmorrhoids—piles.
Helminth—any parasitic worm.
Hepatitis—inflammation of the liver.
Host—an animal or plant on which a parasite lives.
Hyperæmic—congested.
Hyperpyrexia—fever with temperature of 107° F. or over.

Incubation period—the time from acquiring an infection to the onset of the illness.
Insomnia—sleeplessness.

Kala-azar—Indian word meaning black fever.

Larva—the grub stage of insects, or immature stage of worms.
Larynx—the voice-producing part of the windpipe.
Leishman—Sir William Leishman, discoverer of the Leishmania group of parasites.
Leucocyte—a white blood-corpuscle.
Leucocytosis—an increase in white blood-cells.
Leucopenia—a scarcity of white blood-cells.
Loquacious—talkative.

Malaise—absence of well-being.

Melæna—black motions due to the presence of partially digested blood.
Micturate—to pass urine.
Mucosa—a mucous membrane surface.
Mucus—the glairy secretion from a mucous membrane.

Nausea—inclination to vomit.
Necrosis—death of a small part.
Necrotic—dead.
Neuritis—inflammation of one or more nerves.

Œdema—swelling due to fluid in the tissues.
Œsophagus—the gullet.
Orchitis—inflammation of the testicle.
Organism—an animate creature—a term usually applied to microscopic parasites.

Parasite—an organism living at the expense of its host.
Parotitis—inflammation of a parotid salivary gland.
Peripheral—near the surface; farthest from the centre.
Peristalsis—intestinal movement.
Peritonitis—inflammation of the peritoneum.
Pharynx—the area at back of mouth where windpipe and gullet meet.
Phenomenon—an appearance or happening.
Phlebitis—inflammation of a vein.
Photophobia—hypersensitiveness to light.
Polypi—plural of polypus, a form of tumour.
Portal vein—main vein carrying blood from the intestines to the liver.
Prophylaxis—prevention of disease; preventive measures.
Pyrexia—fever; elevation in temperature.

Rectum—the last part of the large bowel.
Rigor—a sudden shivering fit.

Sandfly—a kind of midge.
Septicæmia—an invasion of the blood by micro-organisms.
Serum—the fluid part of the blood (see also p. 151.)
Sigmoid—that part of the colon between the rectum and the descending colon.
Sigmoidoscope—an instrument for examining the lower bowel.
Sinus—a septic track opening on the surface.
Spleen—an organ situated in the left upper abdomen, and normally weighing about 6 oz.
Stool—fæces; motion; material from the bowel.

Suppression—failure of the kidneys to secrete urine.
Syncope—severe fainting.

Tenesmus—painful rectal spasms.
Toxæmia—a poisoned or toxic condition of the blood.
Toxins—poisons from germs or parasites.
Trachea—the windpipe.

Ureters—urinary channels from kidney to bladder.
Urethra—urinary channel from the bladder to the surface.

Vaccine—a standardized emulsion of sterilized germs.
Virus—the poison of an infectious disease.
Vitamin—an undetermined but vital part of food.

WEIGHTS AND MEASURES

Length

1 Micron (μ)	= the thousandth part of 1 millimetre.
1 millimetre (mm.)	= the tenth part of 1 centimetre.
1 centimetre (cm.)	= about two-fifths of 1 inch.
1 inch (″)	= about 2½ centimetres.

Solids

1 gram (G)	= about 15½ grains.
100 grams	= „ 3 ounces.
1 kilogram (Kg)	= „ 35 ounces.
1 drachm (ʒ)	= „ 3¾ grams.

Fluids

1 cubic centimetre (c.c)	= 1 mil = about 17 minims.
$\frac{1}{100}$ cubic centimetre	= 1 centimil.
1 minim (♏)	= about a drop.
1 fluid drachm (ʒ)	= „ 3½ cubic centimetres.
1 pint = 20 fluid ounces	= „ half-a-litre or 500 c.c.
1 litre	= about 1¾ pints or 35 fluid ounces.

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